WORLD PETROLEUM

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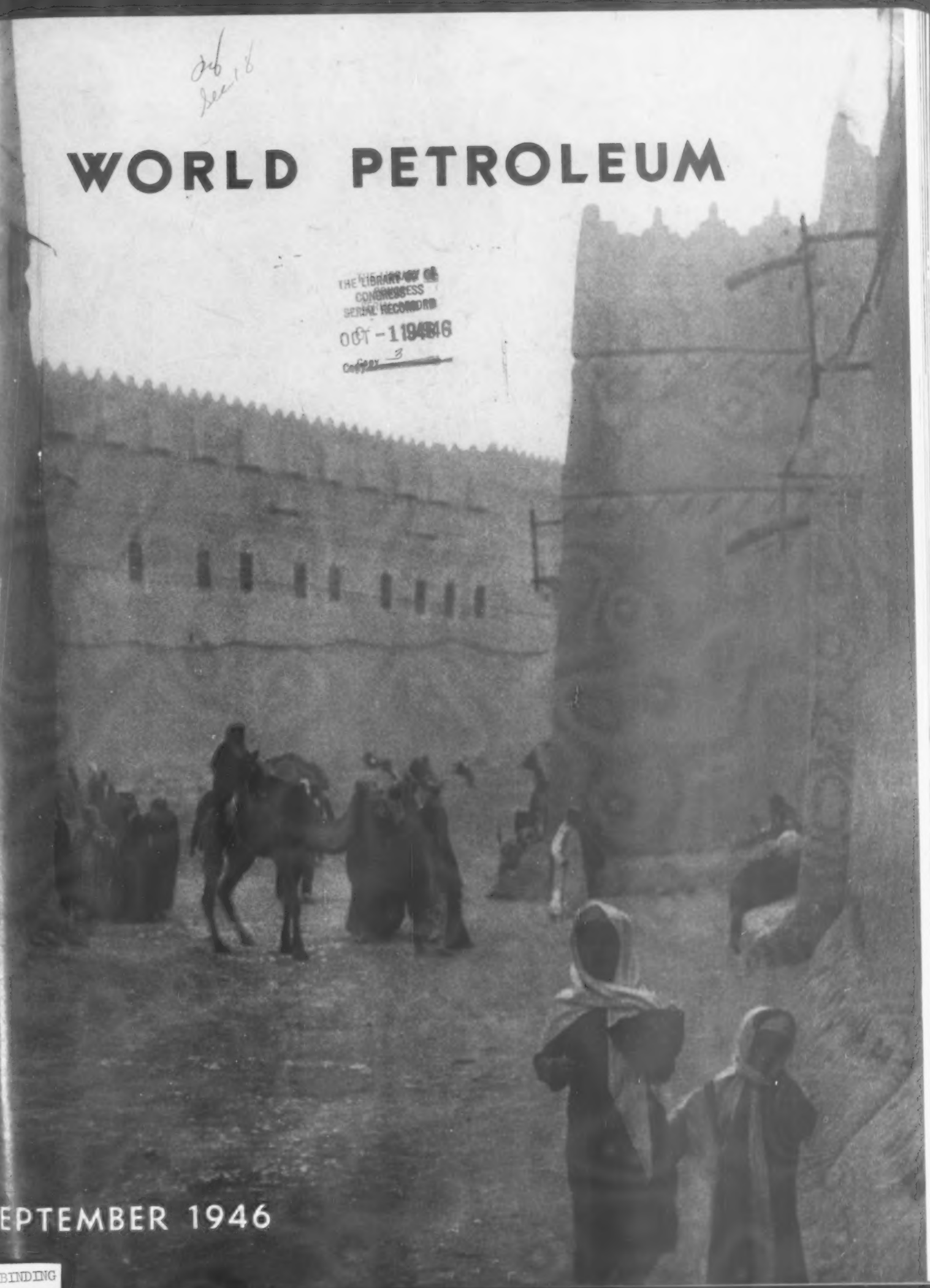

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SEPTEMBER 1946

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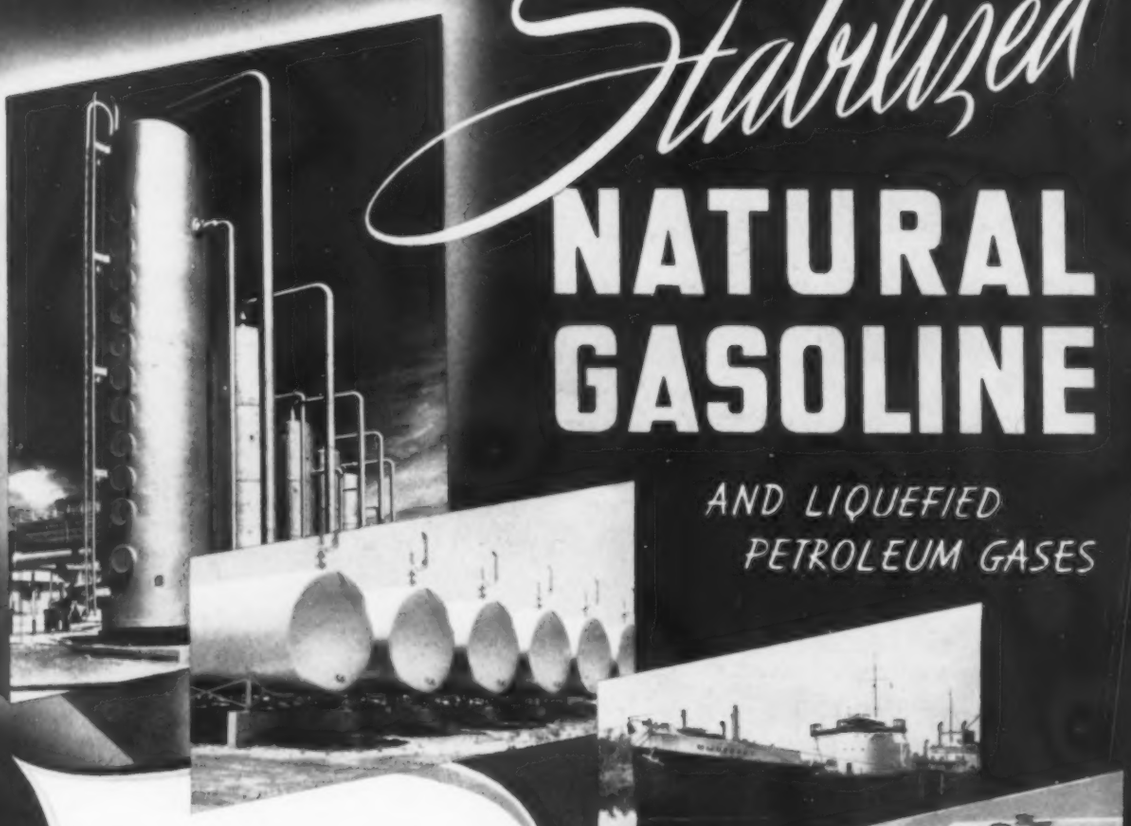
ECONOMICAL · EFFICIENT · DEPENDABLE

WARREN *Stabilized* NATURAL GASOLINE

AND LIQUEFIED PETROLEUM GASES



Because of their plus elements of speed, power and performance, Warren's Stabilized Natural Gasoline and Liquefied Petroleum Gases insure superior products of uniform quality. Because of greatly increased skill, improved equipment and expanded production, Warren's vast network of plants, storage terminals, loading facilities and tank car fleet insure better service and improved delivery. Warren also maintains adequate High Pressure Export Storage Facilities.

Because of these important factors refiners are taking advantage of the opportunity to improve their own products and customers service. You, too, can contribute to the expanding activities and increased tempo of world transportation, industry and agriculture. Warren earnestly invites your inquiries.

NATURAL GASOLINE

Chemical Grade

HYDROCARBONS

Iso-Pentane
Normal Butane
Iso-Butane
Propane
Hexane

STA-VOL-ENE

WARREN PETROLEUM CORPORATION

Manufacturers, Exporters and Marketers of Natural Gasoline and Liquefied Petroleum Gas

Tulsa, Oklahoma

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas; Lake Charles, La., Marcus Hook, Pa.

. . . now available, including 45°, 90° and 180° elbows, tees, caps, reducers, lap joint stub ends. Write for the name of your nearest distributor. Return the coupon for new bulletin giving full information on Tube-Turn Stainless Steel Welding Fittings.

TUBE TURNS (Inc.), Louisville 1, Kentucky. District Offices: New York, Washington, D. C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston, San Francisco, Seattle, Los Angeles.

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TUBE TURNS, Inc., LOUISVILLE 1, KENTUCKY
Please send new bulletin on Tube-Turn Stainless Steel Welding Fittings.

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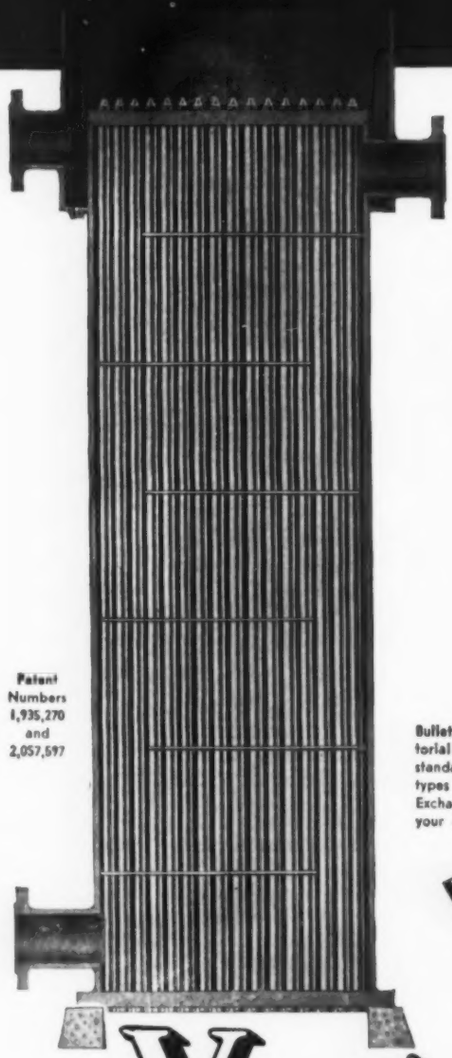
3209

FILM TYPE EXCHANGERS

DETAIL SHOWING DISTRIBUTING FERRULE IN TUBE (Patent Pending)



Patent Numbers 1,935,270 and 2,057,597

Vogt engineers have taken a familiar refrigeration plant "old timer" and developed it into this modern, efficient heat exchanger.

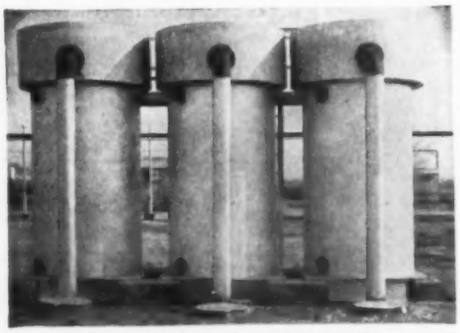
The film type exchanger operates in a vertical position. Water introduced in the top chamber is distributed in a thin film against the inner tube walls by means of special ferrules. The shell side of the exchanger has baffles arranged to provide optimum velocities, pressure drops, and heat transfer rates. Shutdowns are eliminated because tubes can be cleaned while the unit is in operation; thus permitting the use of dirty, mud and silt depositing water.

Vogt Film Type Exchangers now serve as Jacket Water Coolers, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to condense any vapor. They are also applicable for handling liquids other than water in film flow.

HENRY VOGT MACHINE CO., INC.
LOUISVILLE 10, KENTUCKY

Branch Offices: New York, Philadelphia, Cleveland, Chicago, St. Louis, Houston

Bulletin HE-5 is a pictorial presentation of standard and special types of Vogt Heat Exchangers. Write for your copy.



Jacket Water Coolers serving engines of 7,300 H.P. Muddy well water used as cooling medium.

Vogt

HEAT TRANSFER EQUIPMENT

WORLD PETROLEUM (including Petroleum Equipment Exporter), Vol. 17, No. 10, September, 1946. Entered as Second Class Matter at the Post Office at Orange, Connecticut, under the Act of March 3, 1879. Application pending transfer as Second Class Matter to the East Stroudsburg, Pa., Post Office. Published monthly August to June, semi-monthly in July, at 34 No. Crystal St., East Stroudsburg, Pa., by Mona Palmer, Trustee under will of Russell Palmer, 2 West 45th Street, New York 19, N. Y. Subscription price $5.00 per year, single copies 50 cents each.

Laboratory test for tensile strength and elongation on a cured batch sample is recorded electrically.

This Expert

Works for You

and Patterson-Ballagh pays his salary!

You don't see him, but he's there, right beside you. *His* work was done long before the Patterson-Ballagh's Oil Field Specialties you're using reached you. From raw basic ingredients to finished product, this man tests every batch of rubber, each step of the way, for tensile strength, stretch, toughness, and hardness. He knows that each batch, whether it is *PBX Special* for Protectors and Stabilizers, or *Natural* Rubber for Wiper items, will maintain the high standard quality set for it.

Rubber for each Oil Field Specialty used on your derrick is more than ordinary rubber. It is a time-tested compound made from our own special formula, prepared and cured exclusively for each specific use. PBX Special Rubber is the toughest rubber known . . . it stands up, positively protects your casing and drill pipe, and stays put. Natural rubber is resilient, durable, and wipes clean and dry.

Yes indeed, this chemist works for you. His careful efforts assure you of the best in rubber for oil field use.

Remember this the next time you order—it is your assurance of quality. Call in your Patterson-Ballagh man for Oil Field Rubber items.

Specify **PATTERSON-BALLAGH**

A DIVISION OF BYRON JACKSON CO.

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OIL FIELD SPECIALTIES

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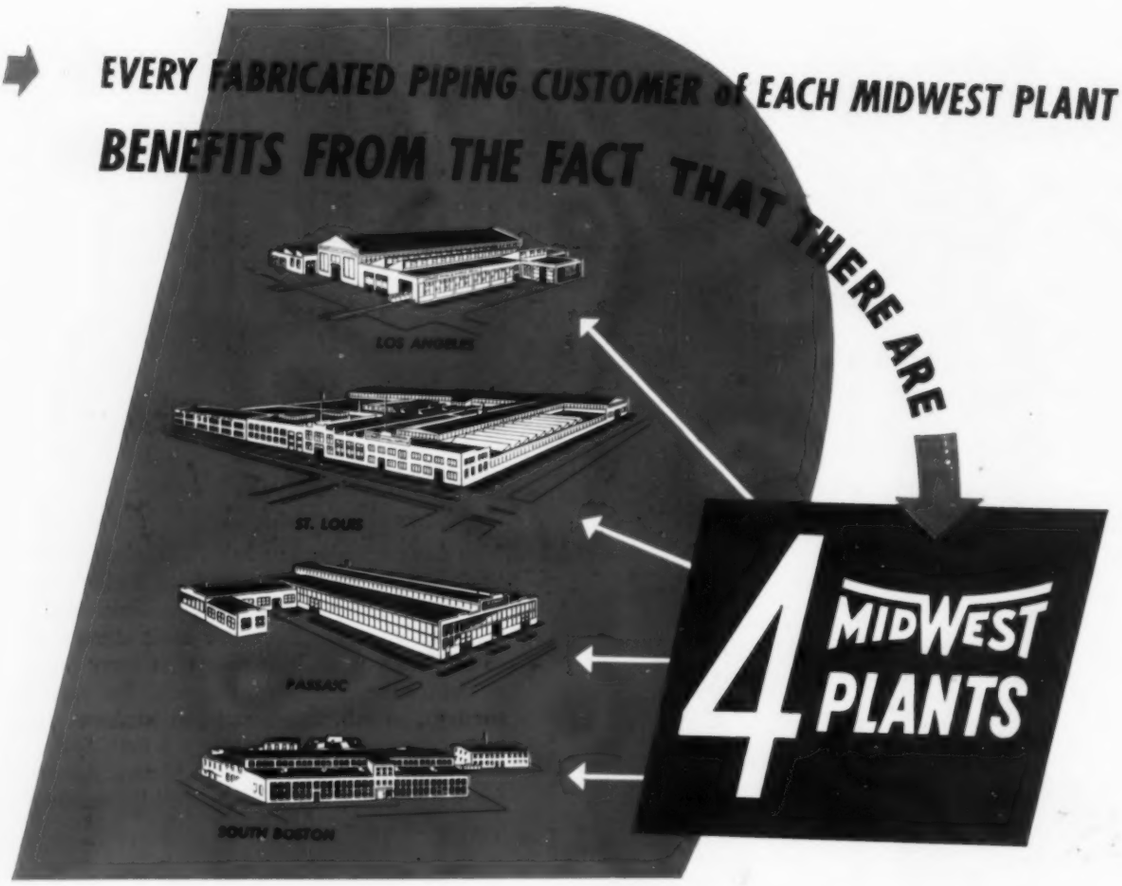
EVERY FABRICATED PIPING CUSTOMER of EACH MIDWEST PLANT BENEFITS FROM THE FACT THAT THERE ARE



Strategically located in various parts of the country, all of the four Midwest plants are of definite benefit to every Midwest customer.

Undoubtedly the most important advantage is the better piping that results from the continuous exchange of information and experience between the four plants. For example, if Passaic develops a new and valuable technique or method, the information is made available at once to St. Louis, Los Angeles, and South Boston. When Los Angeles finds a better way to control grain size in forged lap joints, the other plants are immediately informed. Regardless of which plant fabricates your piping, you get the benefit of the combined experience of all four plants.

Other advantages are greater flexibility in meeting delivery requirements . . . a better understanding of regional conditions . . . source of supply close to the job.

Midwest is logically your first source of piping—whether you want a simple bend, a welded header, or a complete and complex piping job for a large plant fabricated and erected with undivided responsibility.

MIDWEST PIPING & SUPPLY COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Louis, Passaic (N. J.) and Los Angeles • Subsidiary: Lumsden & Van Stone Co., South Boston 27, Mass. • Sales Offices: New York 7—30 Church St. • Chicago 3—645 Marquette Bldg. • Los Angeles 33—520 Anderson St. • Houston 2—229 Shell Bldg. • Tulsa 3—533 Mayo Bldg. • Atlanta 3—Red Rock Bldg. • South Boston 27—426 First St.

4 PLANTS ARE BETTER THAN 1

PIPING FABRICATORS AND CONTRACTORS

BLACK MAGIC

OIL BASE DRILLING FLUIDS

Black Magic is used because:

- It increases oil or gas production.
- Reliable coring data can be obtained.
- Heaving shale in certain cases can be stopped.
- Stuck drill pipe has been freed in several instances after spotting oil, etc., has failed.
- Wells drilled in with Black Magic do not need to be swabbed.
- In most cases bits and reamers have much longer life due to better lubrication with Black Magic than with water base muds.
- Wells drilled in with Black Magic come in clean and clean-up time is eliminated.
- It contains no sodium silicate, lamp black or volatile acids.

Black Magic has the advantage over any other oil base drilling fluid now being made because:

1. It has perfect plastering properties.
2. It is easy to control—viscosity, gel strength and weight.
3. It has the highest deplastering properties of any drilling fluid—thus yielding the highest possible return permeability.
4. Its unique method of regeneration allows it to be used over and over again—the only oil base drilling fluid that can be regenerated from water contamination.
5. It has the highest flash and fire point of any oil base mud on the market and has never caused a rig fire.
6. It can be used to cement in—conditioning or chemical addatives not needed.
7. It is unaffected by cement, salt, or anhydrite.
8. Due to the fact that it is mixed with refined oils instead of crudes containing higher fractions and gasolines, Black Magic has the minimum harmful effect on synthetic rubber equipment.

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The Wiggins HIDEK FLOATING ROOF

- Improved Long-Lasting Seal
- Improved Simplified Construction
- Improved Drainage Features
- Improved Roomy Pontoons (patented)

One of these will reduce your evaporation problems

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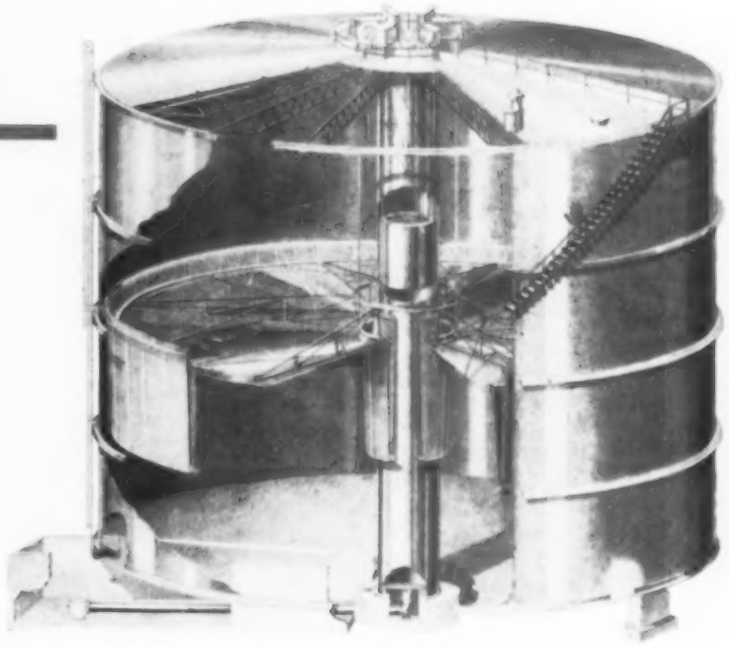
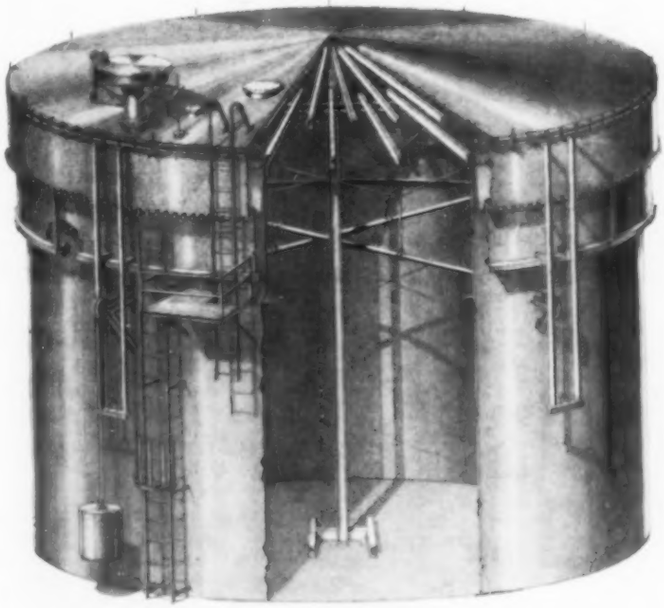
The DRY SEAL GASHOLDER

- Perfect Low Pressure Vapor Balancing For Any Gas, Any Quantity, Any Climate
- Easy Access For Thorough Inspection
- Ten Years Field Performance Endorse The Design
- Can Be Attached To Group Of Existing Tanks Without Shutting Down Their Operation (patented)





The DRY SEAL LIFTER ROOF

- Individual or Multiple Tank Vapor Balancing
- Low Pressure Operation
- Sensitive Balancing
- Lowest Maintenance (patented)

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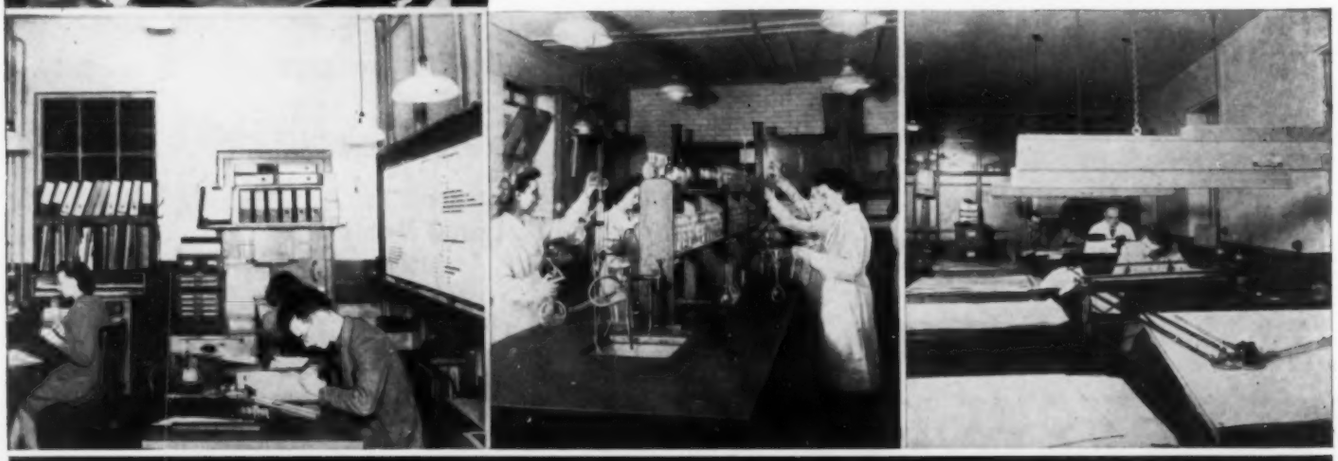
Quasi-Arc Welding Service is based on a most thorough-going organisation . . . its extent is not generally realised by the average buyer or user. This extensive and up-to-the-minute organisation produces the world's finest electrodes and welding equipment—conducts its own training schools in three centres—provides unrivalled technical bureaux—is represented throughout the world.

Wherever you are and whatever your needs Quasi-Arc Service is there to assist.



THE QUASI-ARC Co. Ltd., BILSTON, Staffordshire

Telephone: BILSTON 41905 (6 lines) **Telegrams: "Quazarc, Bilston"**

THERE HAVE BEEN CHANGES IN DRILLING RIGS TOO..

Just as the radio receiver of two decades ago, with its 3-dial tuning, large unwieldly horn-speaker and separate wet batteries for power, is a far cry from the powerful yet compact and unitized radio set of today; so the heavy, ungainly, large and hard-to-move drilling rig of yesterday can no longer favorably compare with Franks' 100% portable, unitized "Slim-Hole" drilling rig. Franks features afford economies which less up-to-date drilling rigs cannot begin to match.

Call or write a Franks Representative for information about these modern drilling rigs.

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING UNITS

STAR FEATURES

- Eliminates Conventional Derrick Cost—derrick is integral part of rig
- Derrick Raised, Extended and Locked in Drilling Position in 4 to 7 Minutes —by power of truck engine
- Rig-up and Start Drilling in 4 to 7 Hours After Reaching Location
- Tear-down and Start Moving in 2 Hours
- Move All But Dog House and Drill Pipe and Accessories on One Truck
- Maximum Economy in Every Item of Expense—Including Water, Fuel and Labor

FIELD SERVICE

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Kansas: Tommy Knoblock, Box 393, Phone 526-W, Lyons, Kansas.
Call these points for Franks Field Service in these areas. Call Franks Main Office for other areas.

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GULF OIL CORPORATION

GULF REFINING COMPANY

Lane-Wells Gun Perforator

SKID HOIST UNIT
FOR SALE TO OPERATORS OUTSIDE OF THE UNITED STATES

All controls are compactly grouped in full view of the operator.

Metal and fabric covers protect the Unit during transportation.

SPECIFICATIONS

Dimensions	
Overall length	84"
Body width, operators end	66"
Body width, drum end	42"
Width fender to fender, drum end	62"
Maximum height	37"
Spacing skid runners, outside edge	37"
Weight (estimated)	
Less Perforator line	2800#
With 12,000' 5/16" line	4800#
With 6,500' 7/16" line	4800#
Power Unit	
Ford 60 H.P. engine	
Electrical Unit	
Onan Generator set 110V—60 cycle	
Drum Dimensions	
Flange	32" O.D.
Core	14" O.D.—22⅜ long
Line Capacity	
12,000'—5/16" reverse armored conductor	
6,500'—7/16" reverse armored conductor	
Line Speeds	
20' to 350' per minute	
Mounting Application	
Flat bed truck—or barge	
Direct mounting on frame of 1½ ton 134" Ford Chassis. (Truck frame must be reinforced and proper tires installed to carry the weight.)	

Lane-Wells light weight Gun Perforator Skid Hoist Unit is designed for gun perforating operations in fields outside the United States where weights, compactness and portability are of prime importance.

Conveniently arranged for maximum compactness with due consideration to accessibility are the necessary controls, line spooler, prime mover, alternating current generator, weight indicator dial, depth indicating device, safety and firing switches, and cables all wired and ready to connect to the rig equipment and gun perforator.

Equipment offered for export sale is identical in every respect to the equipment used in the United States.

Lane-Wells will train the customer personnel selected to operate the equipment in all phases of inspection, maintenance, and operations and supply complete operating manuals.

Tomorrow's Tools—Today!

LANE WELLS COMPANY

Los Angeles • Houston • Oklahoma City

General Offices, Export Office and Plant:

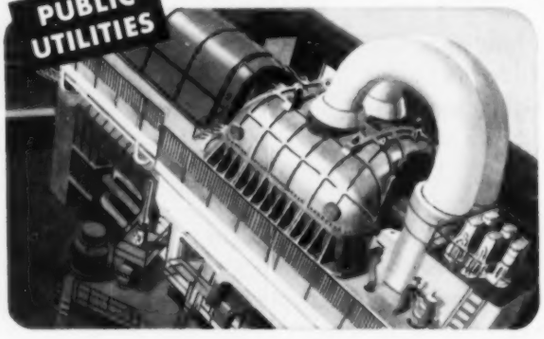
5610 South Soto Street • Los Angeles 11, California

Watch industry FLUID-DRIVE* AHEAD!

PAPER

1 Constant speed A.C. motors are transformed like magic into variable speed units by the addition of Gyŕol Fluid Drive. This modern method of Fluid Driving helps paper makers simplify equipment and cut maintenance costs. In this industry, Gyŕol Fluid Drive transmits power to slitters, coaters, draft fans, rewinders, and conveyors.

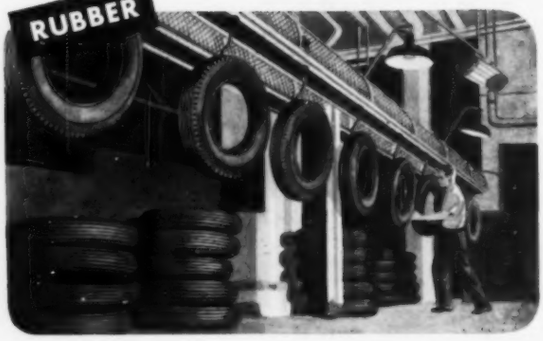
PUBLIC UTILITIES



3 Thirteen years ago we made the first industrial installation of Gyŕol Fluid Drive—on a Mechanical Draft Fan. Public Utilities have since discovered equally important uses on boiler feed pumps. In both applications, Fluid Drive provides stepless variable speed control, results in horsepower savings, simplicity of control, long equipment life, and increased overall power plant efficiency.

* *Gyŕol Fluid Drive is a product engineered and developed for American industry by American Blower. It is designed for applications where smooth transmission of power or stepless variable speed control is desired. Looking beyond the long list of applications already developed, we will work with you to find new ways to "Fluid-Drive Ahead!"*

RUBBER



2 Now conveyors can travel thousands of miles without a single broken shear pin! *Sounds fantastic*—but it's absolutely true for conveyors equipped with Gyŕol Fluid Drive. The rubber industry protects equipment with Gyŕol Fluid Drive. Conveyors start smoothly—under heavy load—with minimum power. Shear pin breakage is ended.

AND YOU?

Frankly, we cannot say where Gyŕol Fluid Drive will next be used. However, if you have a power transmission problem, remember:

1 **Standard constant speed A.C. motor, plus Gyŕol Fluid Drive, equals stepless variable speed—in a compact, complete unit.**

2 **Thousands of Gyŕol Fluid Drive applications prove its ability to give smooth load pick-up and eliminate strains of overloading.**

Investigate the Gyŕol Fluid Drive for your business. Contact the nearest American Blower Branch Office. Our long experience is available to you!

AMERICAN BLOWER

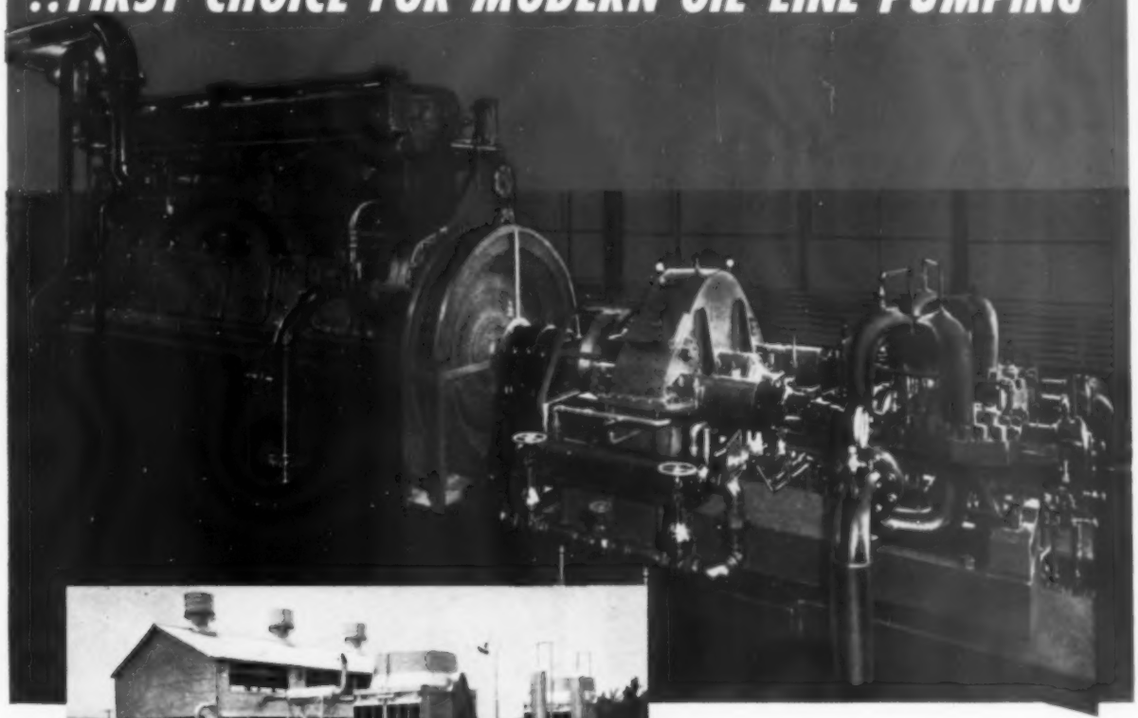
GYŔOL *Fluid Drive*

AMERICAN BLOWER CORP., DETROIT 32, MICH.

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

Cooper-Bessemer

..FIRST CHOICE FOR MODERN OIL LINE PUMPING



The above engine, installed in a California crude oil pumping station, is a Cooper-Bessemer Type JS 8-cylinder gas engine rated 600 hp at 400 rpm. It is directly connected to a dual pinion speed increaser driving a pair of 4-stage centrifugal pumps. At left is an exterior view of this modern station showing quad radiators, air cleaners and other auxiliary equipment.

The modern installation pictured here, on a major oil company's crude line from Ventura to Los Angeles basin, is perhaps unique on the west coast. Here a Cooper-Bessemer Type JS gas engine is driving a pair of 4-stage centrifugal oil pumps through a dual pinion speed increaser. This rugged engine will give efficient, economical service for years to come and with a very minimum of down-time.

In Cooper-Bessemer Diesels and gas engines you'll find all the modern developments that contribute to long-term satisfaction in heavy-duty service. You'll also find many worthwhile advancements that are available in Cooper-Bessemer engines alone, such as tough, wear-resisting Meehanite Metal, saddle-type piston-pin-to-rod construction, efficient turbu-flow oil cooling of pistons, and many other features that mean the utmost return on your investment dollar.

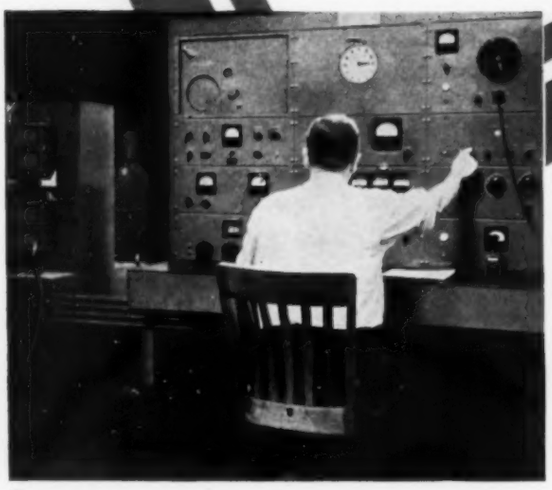
There is a Cooper-Bessemer office near you, inviting the chance to give you full details on the proper type and size Cooper-Bessemer for your particular service.

THE Cooper-Bessemer CORPORATION

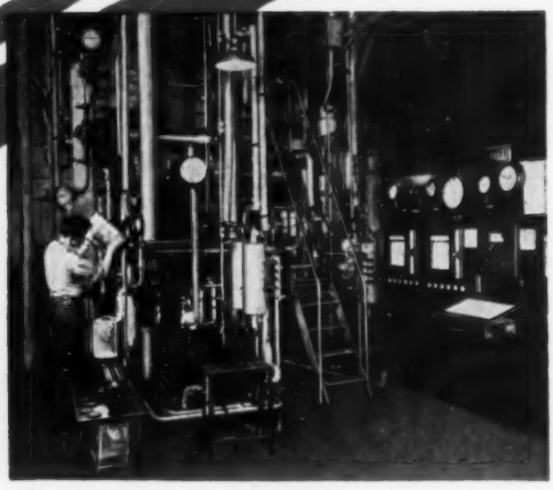
Mt. Vernon, Ohio • Grove City, Pa.

New York, Washington, Bradford, Pa., Parkersburg, W. Va., San Francisco, Cal., Seattle, Wash., Houston, Dallas, Greggton, Pampa and Odessa, Texas, Tulsa, Shreveport, St. Louis, Los Angeles

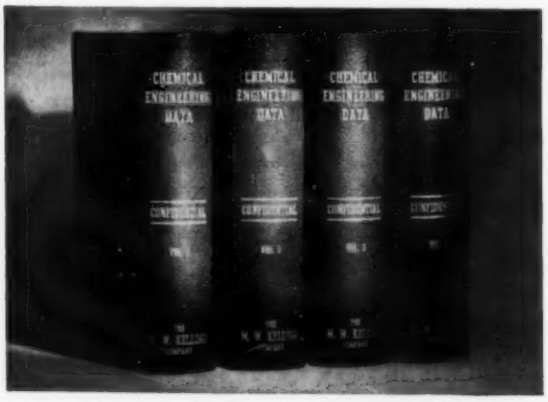
For BEST results we use all nine!



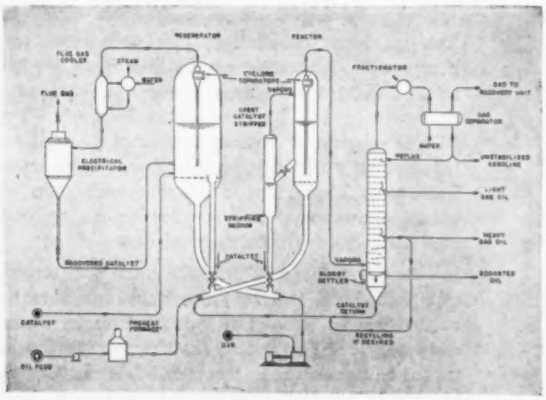
1 LABORATORIES.
Fully equipped, they are staffed by technicians who have made many significant contributions to the science of oil refining, as well as in the field of continuous chemical processing.



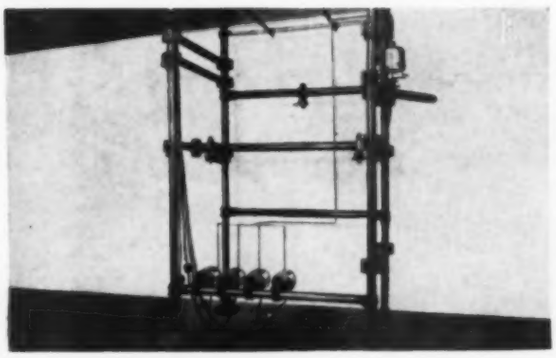
2 24-HOUR-A-DAY PILOT PLANTS.
The most complete pilot plant operation in the oil industry, it includes apparatus to reproduce every major type of refinery process. Operating weight balances so closely approach 100% that results may be converted directly into full-size commercial scale.



3 EXCLUSIVE CHEMICAL ENGINEERING DATA.
Continuously compiled by a special division of the company, data are derived from Kellogg unit process specialists themselves, from pilot plant operations, from Kellogg built refineries throughout the world, from published literature and from scientific meetings.



4 PROCESS ENGINEERS.
Top-flight, experienced talent has made many outstanding contributions to Fluid catalytic cracking, phenol extraction, naphtha reforming, "Tower" propane deasphalting and other major developments . . . and continues to explore new and more profitable methods of refining.



5 MECHANICAL ENGINEERS.
Hundreds of mechanical engineers, trained by Kellogg and thoroughly familiar with oil refining, translate into metal the findings and recommendations of the laboratory, pilot plant and process engineers. Aided by such exclusive methods as "Electrical Stress Analysis," they insure that Kellogg plants are never over- or under-built.

6 METALLURGICAL LABORATORY.
This laboratory develops wholly new fabricating techniques, such as the unique method of molecularly bonding alloys to carbon steels . . . tests and specifies the exact materials to provide maximum performance. Among many major tasks it undertakes continuous studies on corrosion and detailed work on low temperature application.

7 PERMANENT CONSTRUCTION CREWS.
Career-man crews—Kellogg-trained skilled engineers and artisans—have been formed over the years. Truly specialists, they are assigned by Kellogg to refinery construction work throughout the world. For no matter how well conceived, designed and engineered, a refinery is no better than its construction.

8 INITIAL OPERATION SPECIALISTS.
Kellogg operating crews aid in speedily balancing all operating factors on new units . . . provide the invaluable operating viewpoint to the Kellogg design groups. They also are trained to instruct refiners' operating staffs for optimum operation under current and possible future conditions.

9 ECONOMICS STAFF.
Analysts with the widest personal refining experience, supported by Kellogg's forty years of corporate experience, survey every Kellogg-conceived project to improve the economics of operation. With growing competition, superior economics in the operating phase become increasingly important.

THE COMPOSITE CONTRIBUTION of all these interrelated departments produces a refining unit or a complete refinery with utmost performance capabilities . . . with high stream efficiencies built-in. That is the essence of the service that M. W. Kellogg offers oil refiners.

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Engineers and Economists to the Petroleum Industry
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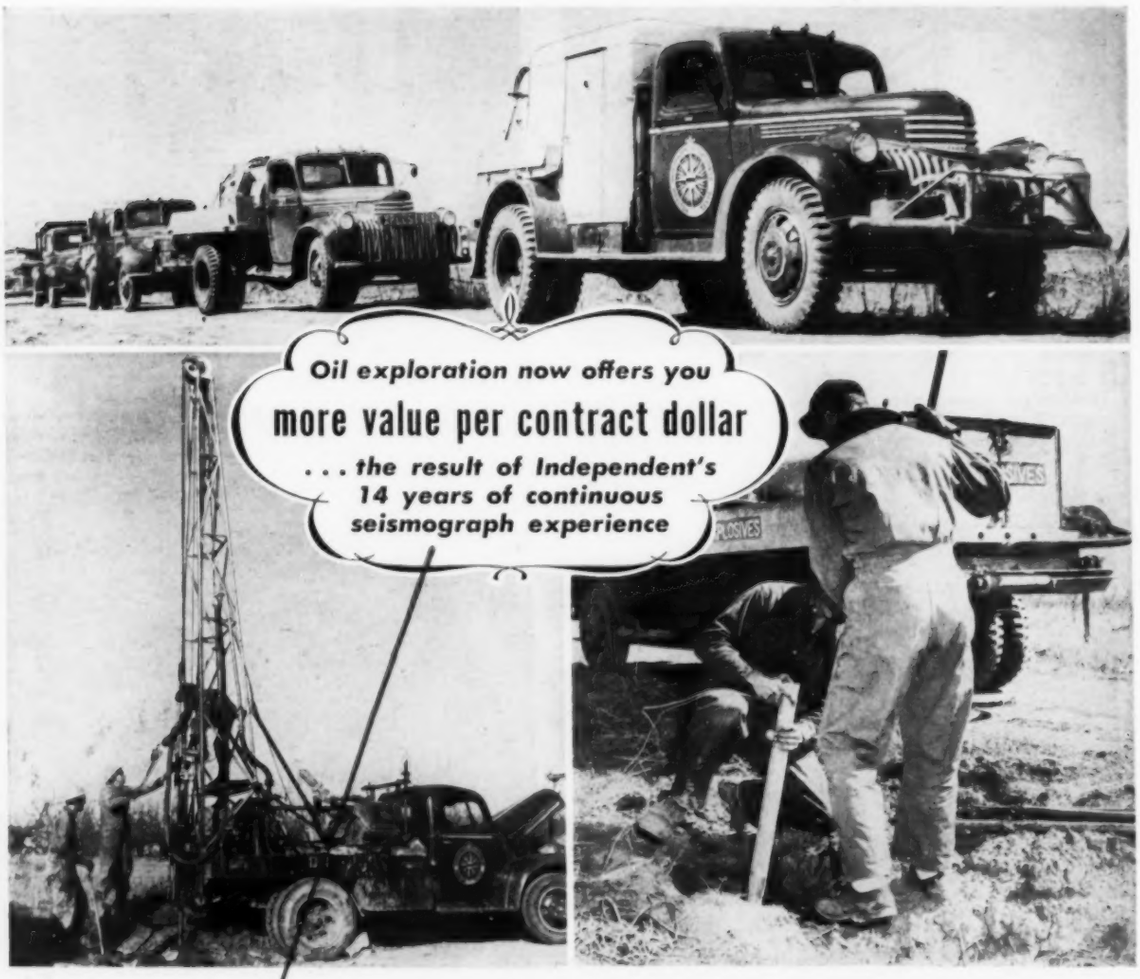
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Write for quotations on Hortonspheres and Hortonspheroids, stating capacity desired, product to be stored and operating pressure.

The above views were made at a refinery in the West Indies. The Hortonspheroid (shown directly above) holds 100,000 bbls. and operates at 2½ lbs. per sq. in.

The two Hortonspheres in the upper right hand corner of this page are 10.5 meters in diam. and operate at 75 lbs. per sq. in.

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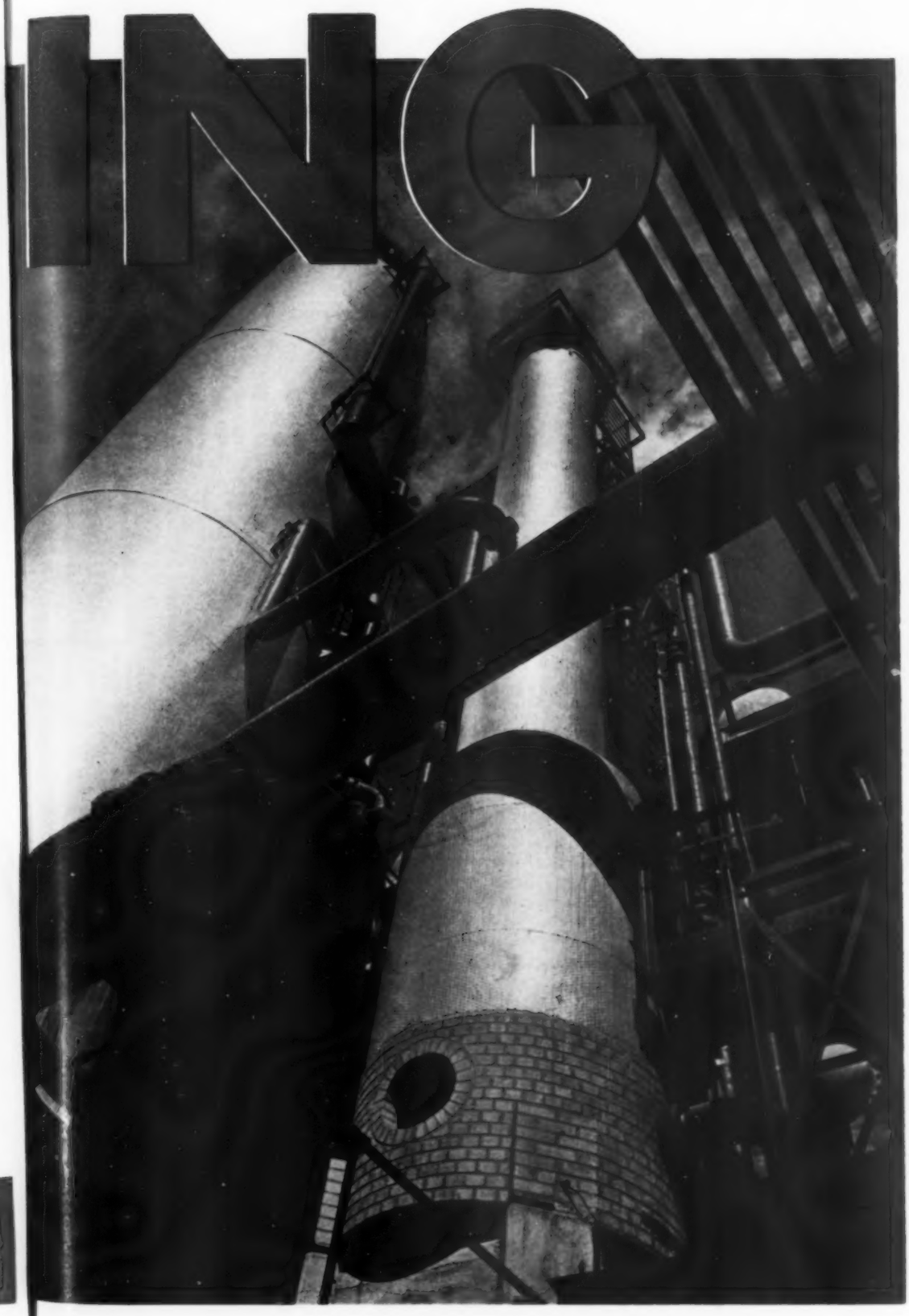
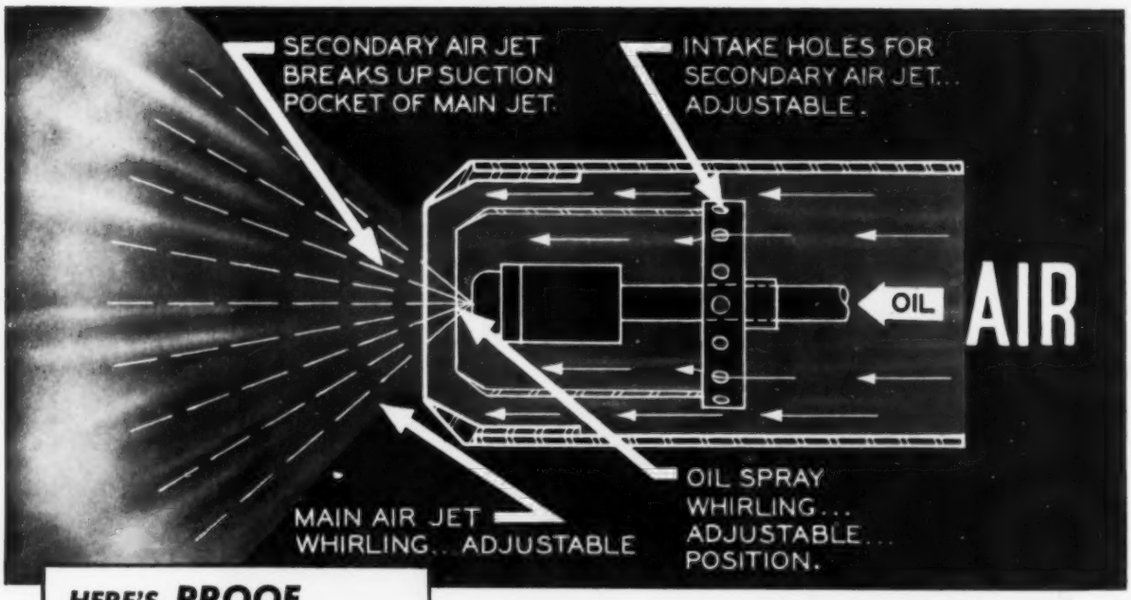

INC

No other combustion head has
ALL THESE FEATURES!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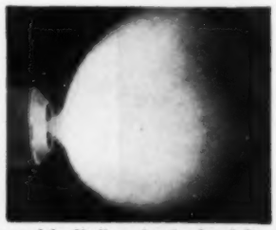
HERE'S PROOF OF DESIGN BENEFITS!

Flame of a conventional gun-type burner. Irregular pattern, "bumpy" at low oil-consumption rates. Excess-air percentage is necessarily high.



Flame of the Shell combustion head. Steady, controllable pattern. Complete combustion with but a negligible amount of excess air.

NEW SHELL DESIGN offers manufacturers new economy in their domestic oil burners

A SIMPLE physical phenomenon—the fact that a low pressure area exists in the center of an air jet—has plagued oil burner manufacturers for years. This low pressure area, unless controlled, acts as an erratic pull against the flame. It is one reason for "bumpy," noisy burning.

Shell research scientists, in seeking more efficient burner operation, have perfected a new combustion head which not only eliminates the erratic suction-pocket effect, but provides a more intimate mixture of air and fuel and *better control of that mixture.* By maintaining uniformly high air velocities, even with low oil rates, this design assures burner manufacturers smokeless combustion with up to 14.5% CO_2—performance considered excellent even for large industrial installations.

Licensing Arrangement—Shell does not manufacture this patented combustion head, but does make the design available to oil burner manufacturers under license. Write for details.

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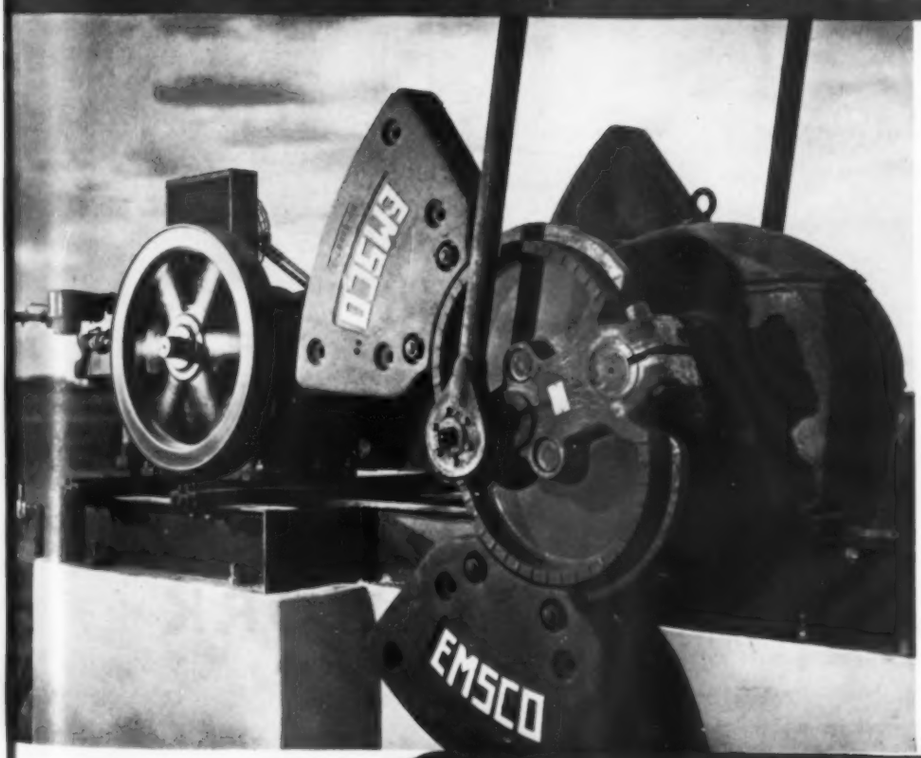
EMSCO DC-77 UNIT PUMPER + CSCO-66 PUMPING ENGINE



▲ Emsco Type DC-77 Unit Pumpers are equipped with adjustable wing type counterbalances —*a one-man operation for easy and accurate adjustment.*

▲ Emsco Pumpers have any position between zero and maximum counterbalance effect provided.

▲ Continental's CSCO-66 Pumping Engines have all the wanted features for economical and dependable pumping—*24-hour operators.*

▲ Ask a Continental representative about these machines—*you'll be convinced that you have a smooth working team for your pumping needs.*

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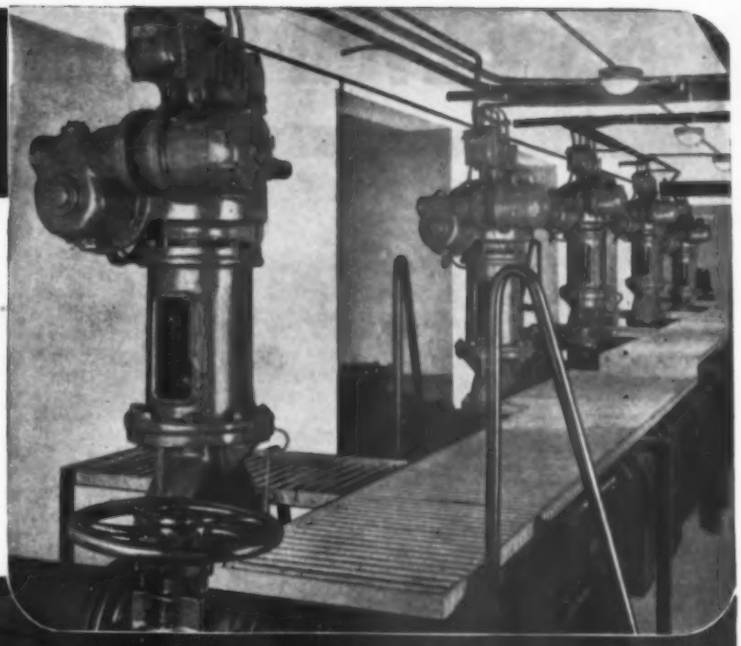

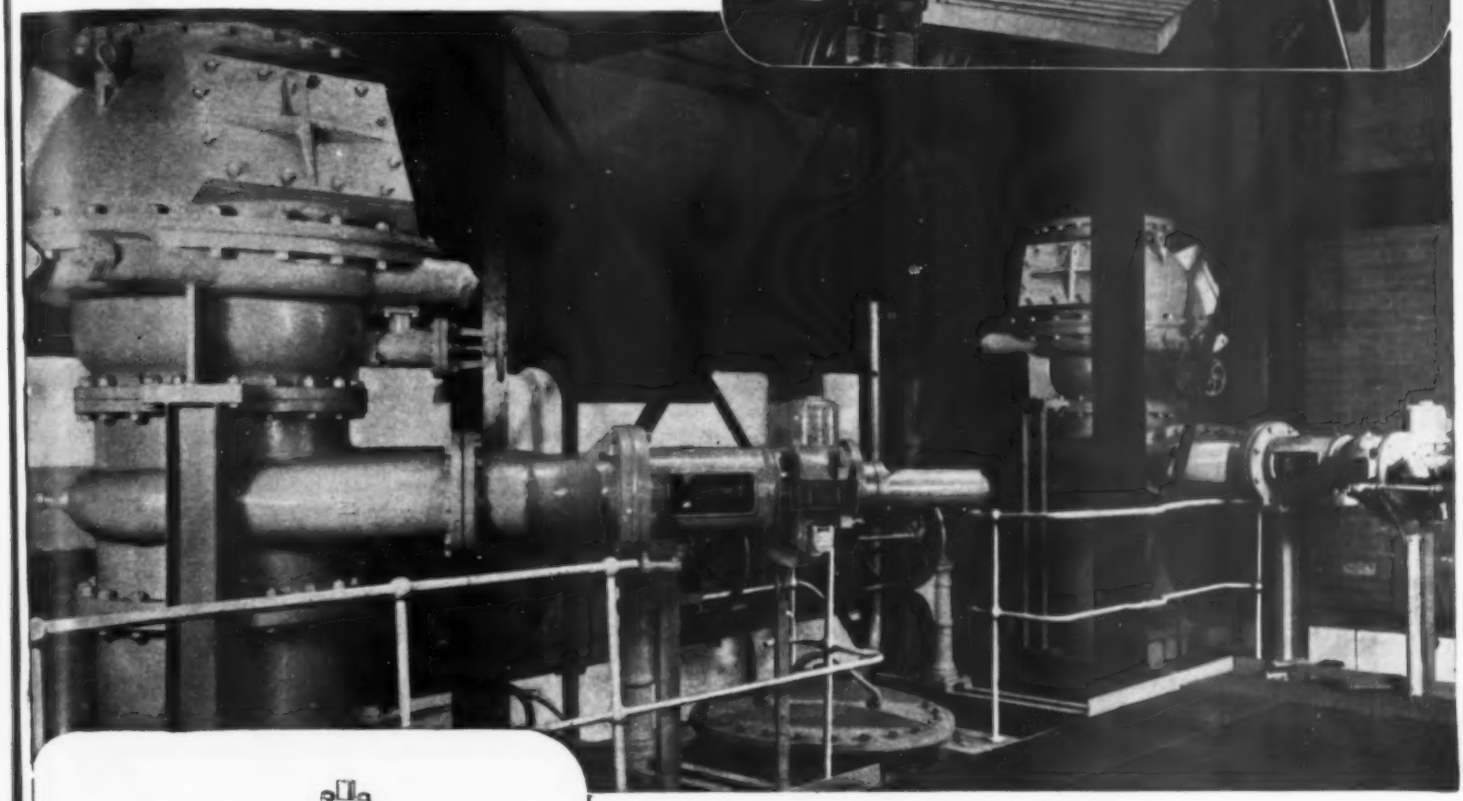

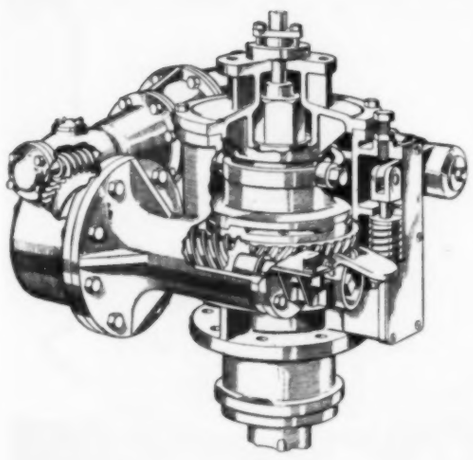

Amongst many features of interest the gear unit is worth particular notice, including the special torque-limiting clutch which gives positive protection in the event of obstruction to the travel of the gate, and enables the valve to be correctly seated without fear of damage due to overrunning of the motor at the limit of closing movement. Electrical gear can be provided to meet any requirements, ranging from the simplest units to equipment for the remote, centralised, automatic or sequence control of numbers of valves. The illustrations show Blakeborough electrically operated valves of wedge gate pattern, but we also supply parallel faced split gate valves, globe valves, butterfly valves, etc. of motorised type, and suitable for any stipulated working conditions.

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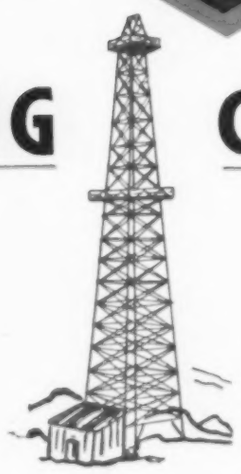

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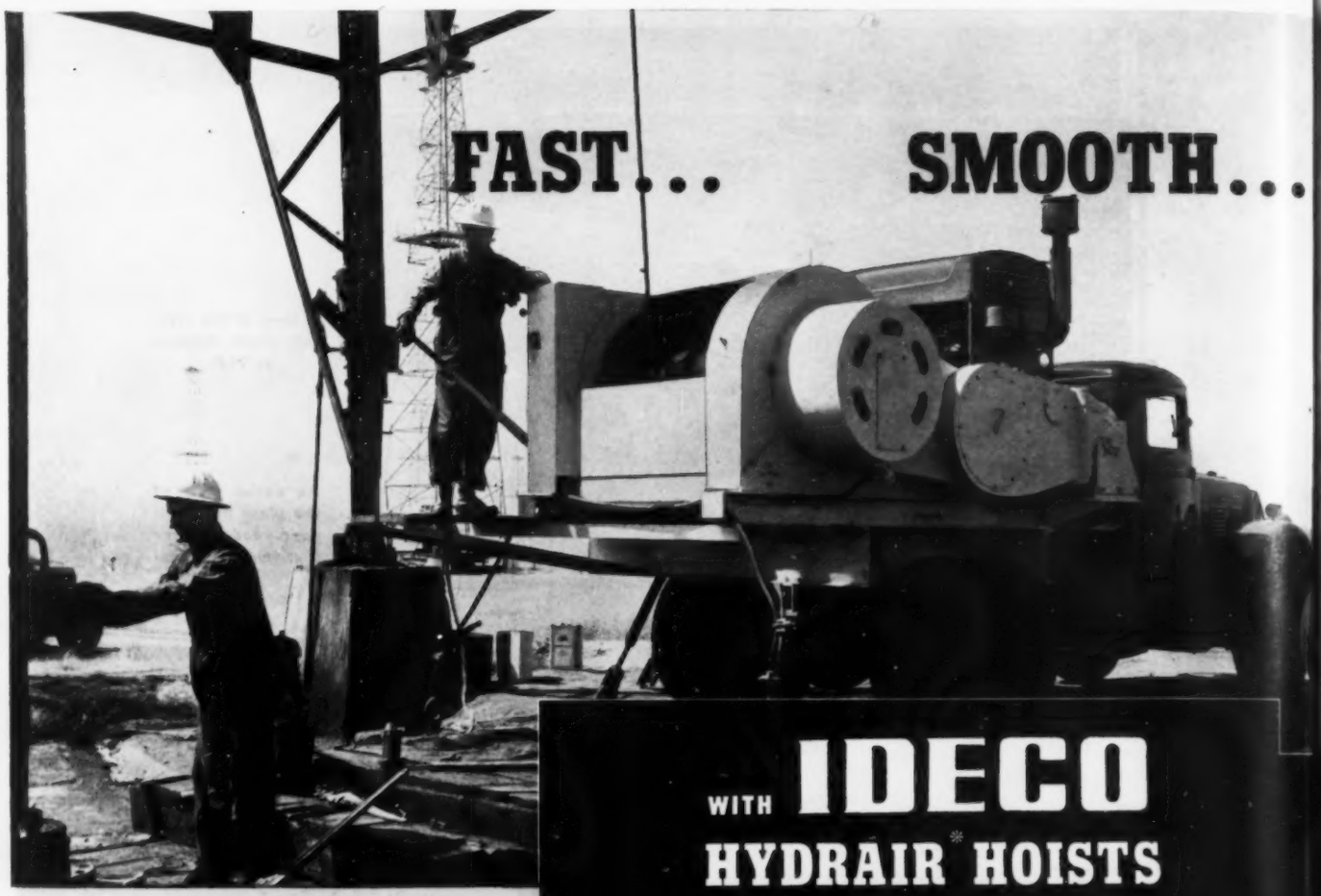
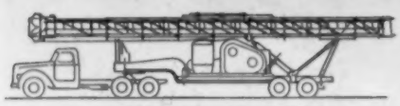


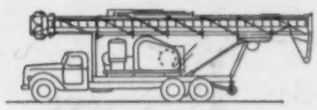
FAST... SMOOTH...

WITH IDECO HYDRAIR* HOISTS

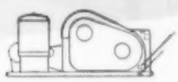
*HYDRAIR = HYDRaulic POWER + AIR clutches



TRAILER MOUNTED



TRUCK MOUNTED



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Infinite, variable speed without gears through the combined use of a torque converter and a "HI-LO" instantaneous speed change arrangement. Fluid power automatically adjusts speed ratios to the most favorable operating conditions . . . gives maximum speed for raising empty block and maximum pull for coming out—instantly—without shock or clutch slipping.

A single lever for high, low, neutral and throttle operates all air controls . . . no maze of foot pedals and hand levers.

Direct air clutches require no adjustment . . . no lubrication . . . provide positive and complete disengagement—no wear when idling.

Ideco Hydrair Hoists are supplied in single or double-drum models, and in three sizes—25,000 lbs., 30,000 lbs., and 40,000 lbs., maximum single line pulls. They are normally furnished as truck or trailer-mounted units in combination with Kwik-Lift Telescoping Masts. They may also be used as skid-mounted hoists under conventional derricks or cantilever masts.

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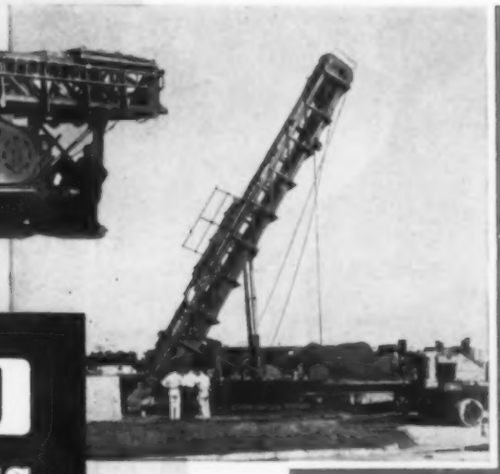
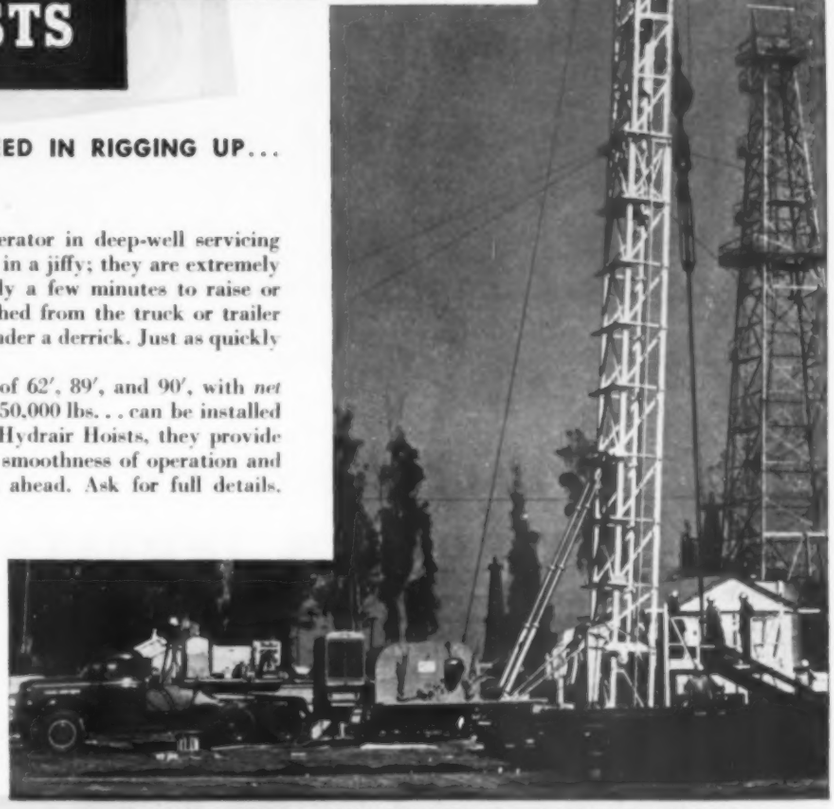
Fluid Power

FOR SERVICING AND DRILLING

Ideco "Rambler Rig" consisting of a Kwik-Lift Mast with Hydrair Hoist.





. . . vehicle —mounted under **IDECO KWIK-LIFT MASTS**

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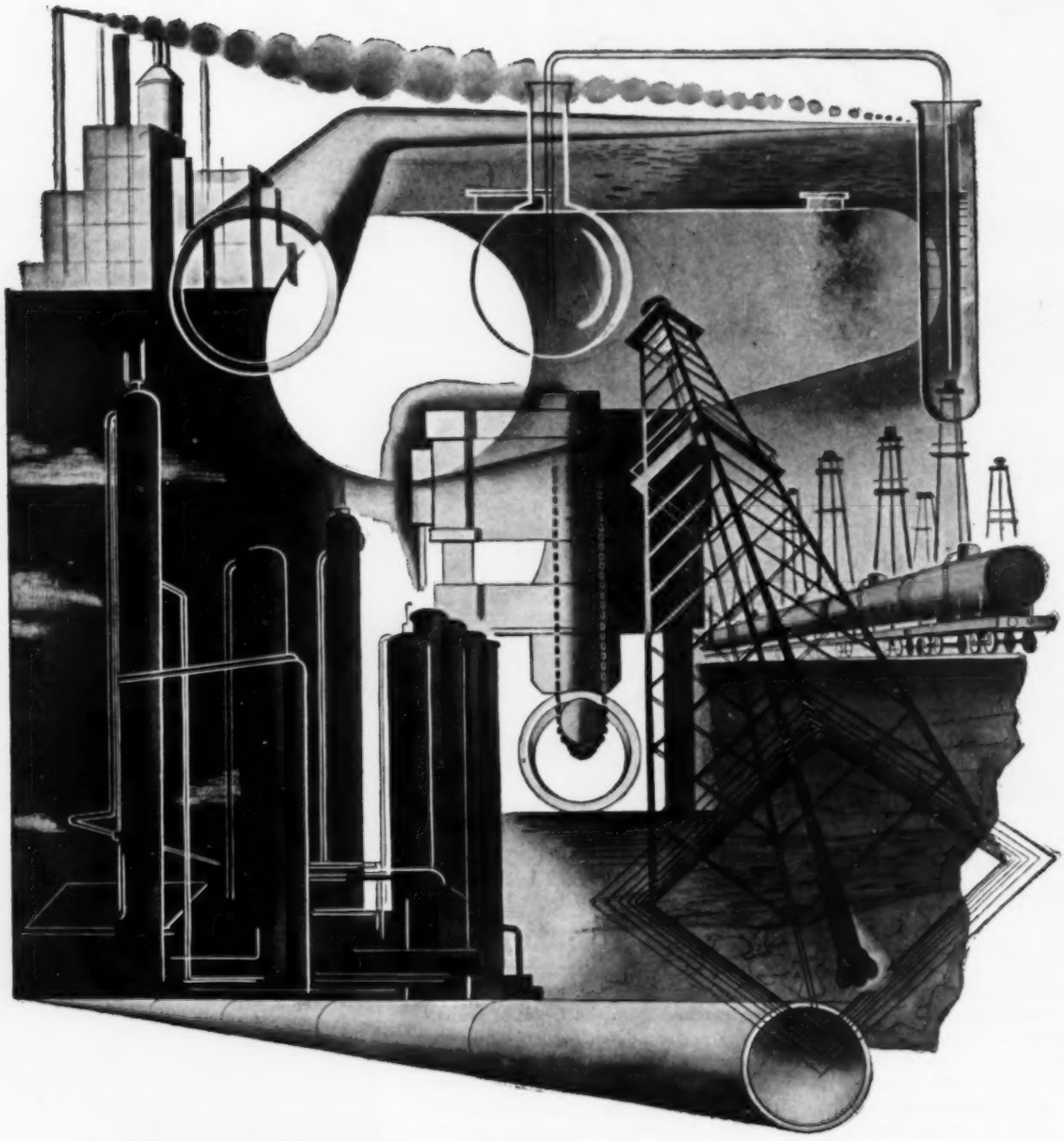

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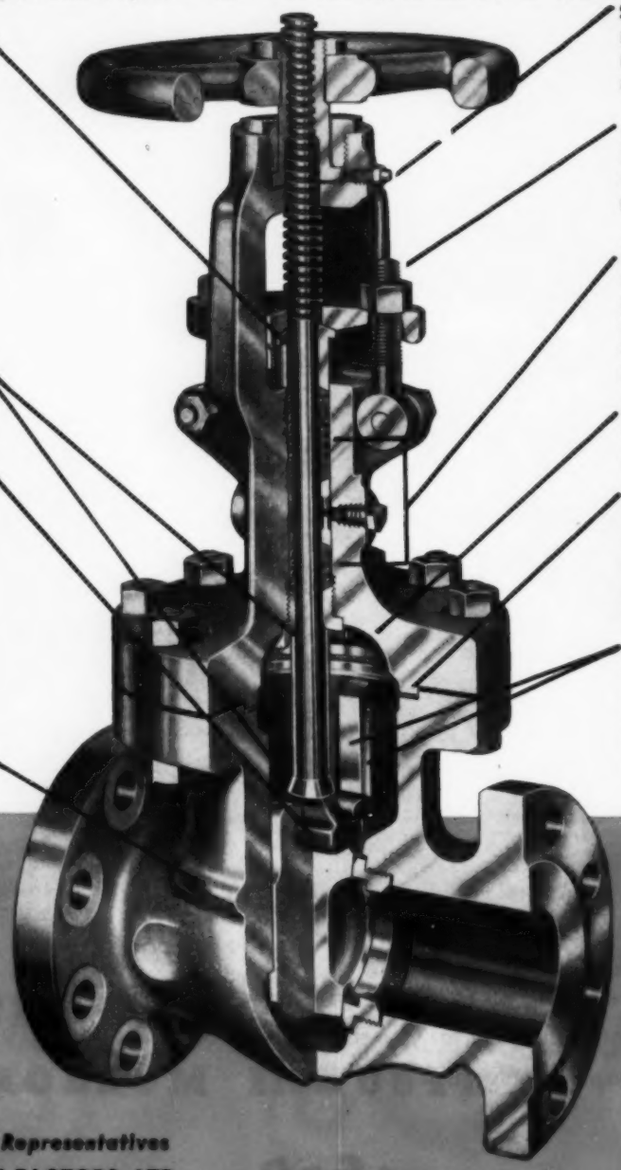

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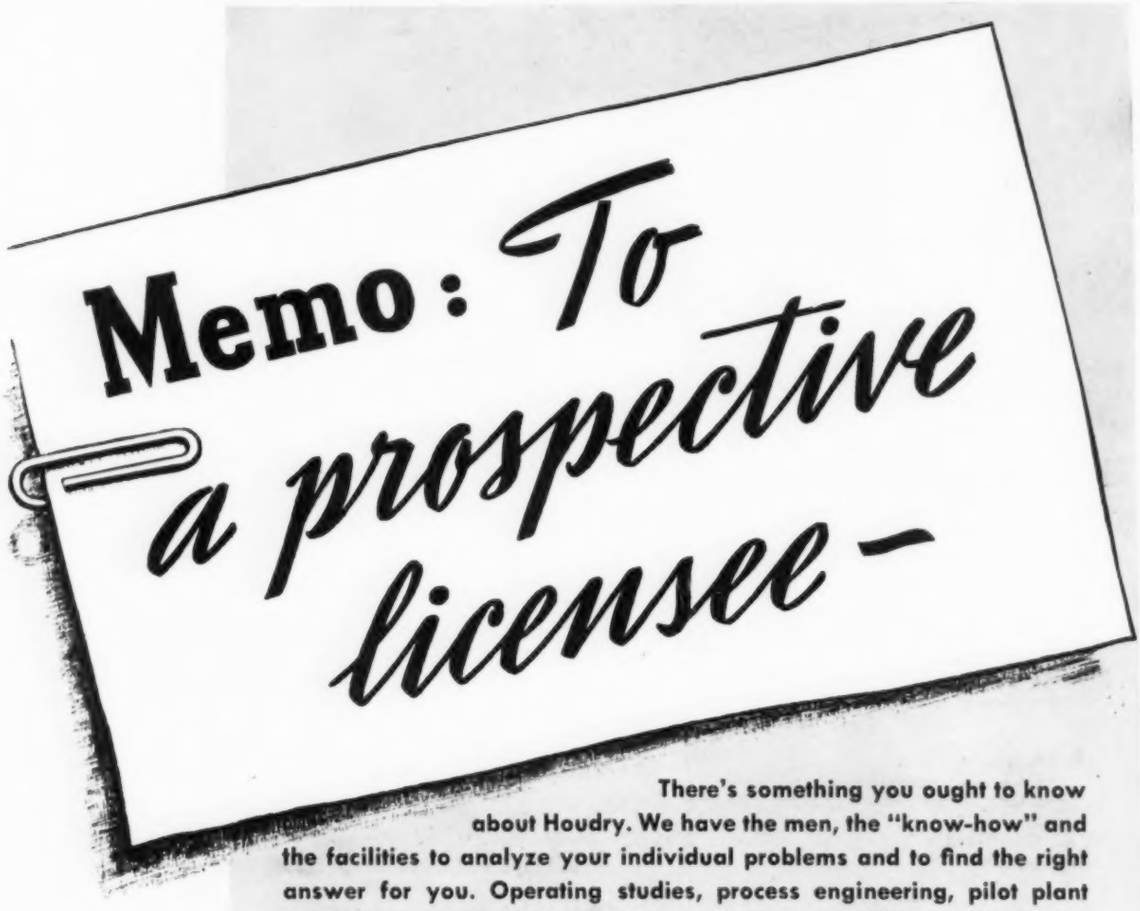
Cover: Near East Street Scene. Photograph Courtesy Bahrein Petroleum, Ltd.

Erratum

Credit for the August cover photograph was omitted from this page last month. Pictured was the Gulf Oil Corp. barge Franklin on the Kentucky river. The photograph was taken by Walter Berry of the Gulf marine department and loaned to World Petroleum by Donald C. White, editor of *The Orange Disc*.



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EDITORIAL

OIL INDUSTRY'S NEW ERA OF CHANGE AND EXPANSION

As 1946 enters its final quarter it is clear that the year marks a definite turning point in the development of the international oil industry. For half a decade the facilities of the industry—its fields, refineries, transportation lines and terminals—over half the globe were being laid waste with all the ingenuity and thoroughness made possible by the modern machinery of war. In the rest of the world oil was enlisted in the combat. Its potentialities and the energies of the men conducting its operations were directed primarily to providing the fuels that powered the armies, the fleets and the air squadrons carrying the titanic struggle to its decisive finish. World War II demonstrated that victory rests, not necessarily on the side of the heaviest battalions, but rather with the contender who can produce and put to effective use the greatest quantities of liquid fuels and other derivatives of petroleum.

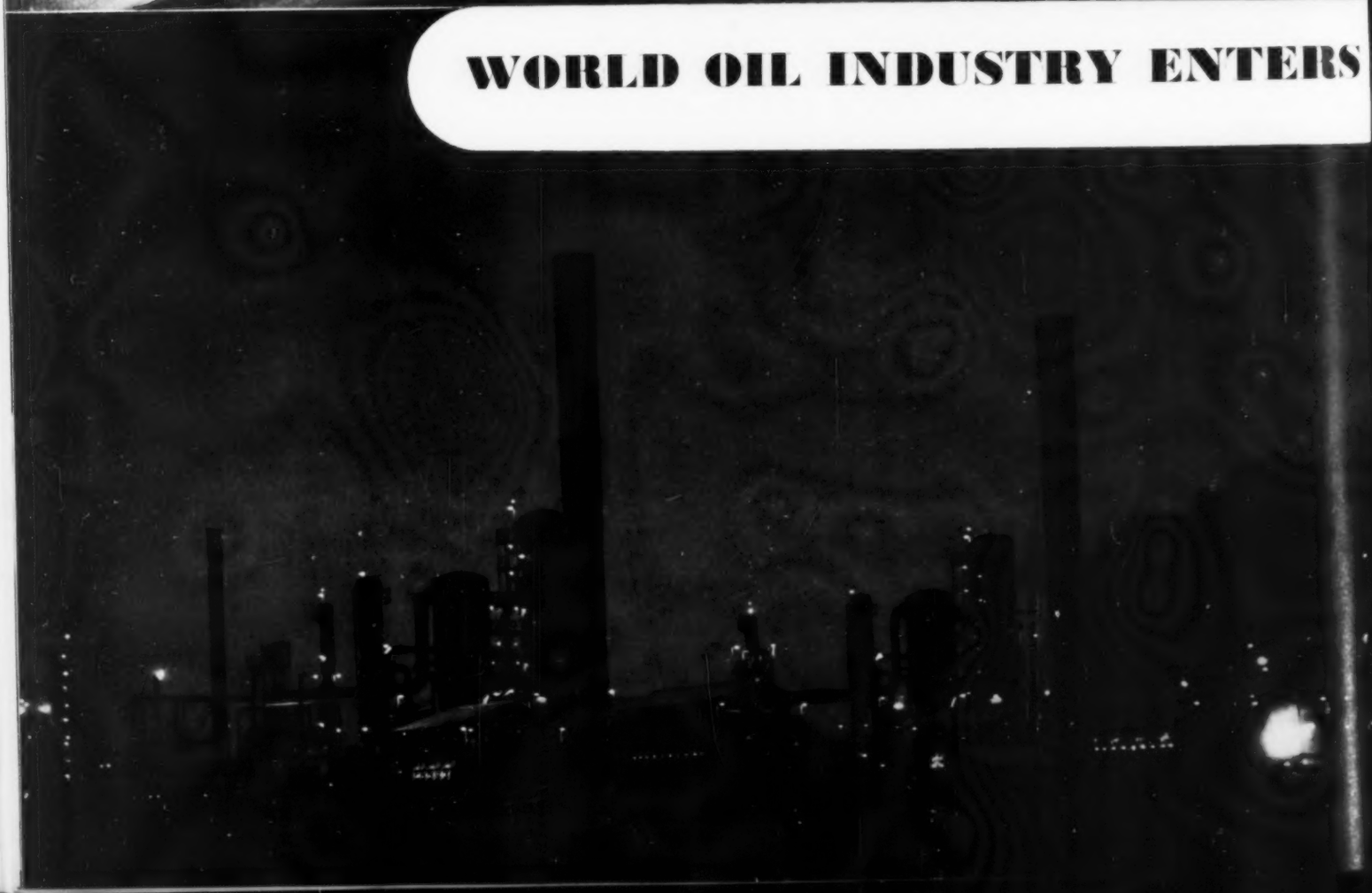
Under the stress of war the ordinary routine of oil industry operation was completely changed. Competition practically ceased; products were pooled; supplies for civilian use were drastically curtailed; prices were fixed. The military was in command and determined what form the industry's products should take, where and how they should be used In a sense the change in this situation may be dated from August 1945. In the United States the War Production Board promptly relinquished its controls and the restrictions upon the use of petroleum products by individual consumers were lifted directly following Japan's surrender. Even here, however, price control did not come to an end until August last and then was removed only tentatively. In other parts of the world government agencies still regulate the distribution of limited available supplies or these are controlled and directed by armed occupying forces.

These may be regarded as temporary factors which will gradually disappear as industrial life returns to a relatively normal course in the countries on which war has had its most shattering effects. But there are deeper and more permanent changes which are gradually emerging, the full influence of which cannot yet be measured but which are bound to alter the future international trade map and to revise the past relationships of important exporting and importing areas. New and prolific producing districts have reached a stage where a place must be found for them in the world's markets. Changes in governmental policies affecting oil are taking place. Above all, the urge to discovery has attained new proportions and the search for sources of supply hitherto unrevealed is being pursued with greater intensity than ever before.

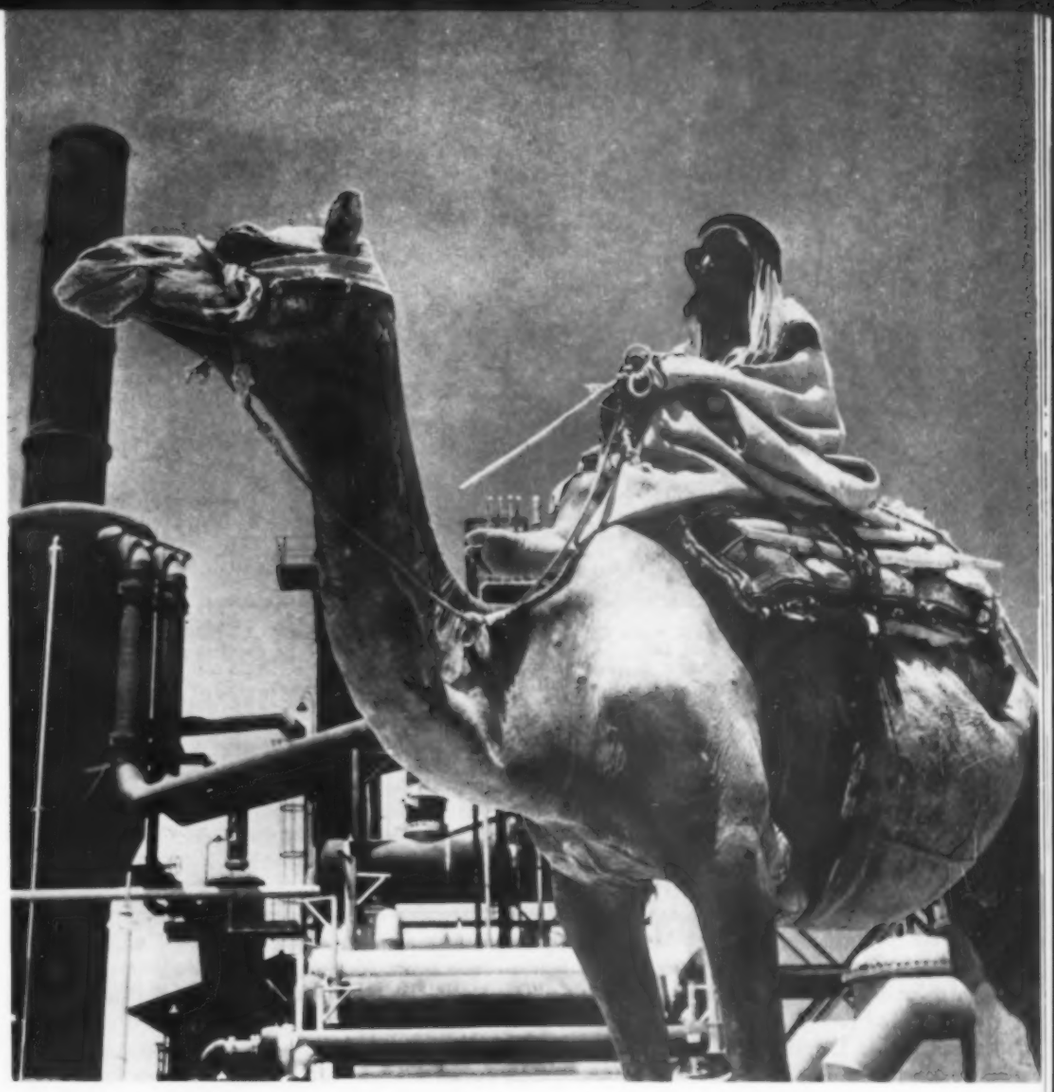
In the settlement of the war through the peace treaties and boundary adjustments now being painfully worked out there are issues at stake which bear very directly upon oil through conflicting ideologies and shifting spheres of influence. In Central Europe new political forces in control have nationalized the oil industry in a number of countries and made it a function of government. In other parts of the world governments are learning that they cannot direct the intricate and venturesome operations of exploration and distribution with the efficiency of free enterprise and are gradually liberalizing their attitude toward private capital for better development of their resources.

While the future, as always, is shrouded in uncertainty some definite trends are evident. The hiatus in trade activity that was expected to follow the close of the war has not eventuated. We are moving into a period of swiftly expanding demand that is world-wide and without visible limitation providing only that sanity guides mankind's affairs. We are likewise in an era of increasing potential production that will maintain active competition but need not necessarily make that competition destructive. As has been pointed out many times the center of gravity in oil production is shifting with the greatest known resources in the Middle East and those of the Far East still largely undetermined. A straw in the wind that may change future trade routes is the movement of oil from the Persian Gulf to the Western Hemisphere, now modestly beginning. The important fact, however, is that the oil business has grown too big for any one country or one producing region to dominate. There is still plenty of room for future growth and greatness. The position which individual producing areas will ocupy will depend upon the skill with which they adjust themselves to changing economic and competitive conditions.

WORLD OIL INDUSTRY ENTERS



Aerial view of Arabian American Oil Company's refinery and marine terminal at Ras Tanura on the Persian Gulf. This $40,000,000 refinery completed last autumn is producing approximately 85,000 barrels per day of fuel oil, diesel oil and gasoline. Ras Tanura obtains its crude from two pipelines which connect with producing fields at Dhahran and Qatif. The marine terminal shown at lower right loads tankers at 10,000 to 12,000 barrels per hour.



An ancient desert traveler surveys the Ras Tanura refinery.

Left, below—Night view of Ras Tanura refinery. All photographs of the Arabian American Oil Company properties published in this issue are by Robert Yarnall Ritchie.

NEW ERA OF EXPANDING ACTIVITY

THERE has not been time as yet to make more than a small beginning toward repairing the enormous damage inflicted on the world's oil facilities by the late war. In some important producing regions it has not been possible even to gain access to affected properties or to determine the extent of the destruction they have suffered. Nevertheless, the developments of the past twelve months have made it abundantly clear that a new era in the progress of the industry is beginning. It is evident too that this greater expansion will not be confined to any one quarter of the globe or to any one branch of industry activity. It will be marked by the penetration of scientific surveys to hitherto unexplored regions, by greatly increased drilling activity, by the establishment of new transportation faciilties and the extension of distribution services to every corner of the world.

Partly as a result of the lessons taught by wartime experience every nation from the most powerful down to the smallest dependency has felt the impetus to learn of the possible existence of oil within its borders or to stimulate the development of such resources as it is known to possess. While the results of this intensified activity undoubtedly will be disappointing in individual cases the aggregate effect unquestionably will be a great increase in the actual output of oil in different parts of the world and a still greater addition to its potential production.

Several factors have contributed to this worldwide intensification of the never-ending search for oil. To begin with, the war has impressed upon governments and peoples everywhere the advantages to their national economy and the value to industrial development of the possession and utilization of petroleum resources. It has demonstrated to the inhabitants of industrially backward countries the savings in toil and the increase in efficiency that flows from the use of mechanical power. It has emphasized the advantages of oil products for many purposes to which they were but sparingly applied previously and has greatly broadened the range of products derived from petroleum.

One of the influences contributing to confidence in the immediate and rapid expansion of the oil industry has been the absence of the expected recession in demand following the termination of the war. Under the rising tempo of war activities military requirements increased to a point which they involved the consumption of roundly 3,000,000 barrels daily during the later stages of the conflict which altogether is estimated to have consumed upward of 3,000 million barrels. It was assumed, quite logically, that with the sudden termination of the major part of this demand there would follow a decided slump in the use of petroleum products. This assumption was based upon the decrease in the number of motor vehicles in use, the necessity of reconversion of manufacturing plants from the production of war materials before a beginning could be made in relieving the shortage of oil consuming vehicles and machines, the disruption of transport facilities and the means of industrial production in a great part of Europe and elsewhere in the world. Under prevailing conditions it seemed inescapable that the movement of petroleum products would fall at least to the 1941 level. Careful studies led to estimates that four to five years must elapse before demand could be expected to return to the point attained at the close of hostilities in 1945.

Aerial view of part of the Arabian American Oil Company producing field at Abqaiq, 45 miles southwest of Dhahran. Nearly 23,000 acres at Abqaiq have been found to be productive. Wells are spaced about two miles apart and field limits have not been established. Recoverable reserves at Abqaiq are estimated at 2.5 billion barrels but may be a great deal more. Total Aramco production now is nearing 200,000 barrels per day.

Contrary to these estimates the slackening of market activity was short lived. By the end of the first quarter of 1946, the demand for products had caused crude output and runs to stills to return to within five per cent of their volume in the corresponding period of the preceding year. This was true not only in the United States, despite the failure of automotive and oil burning equipment production to proceed as rapidly as had been anticipated, but it held good also in other parts of the world where production in many fields in response to insistent demand actually increased beyond the wartime peak.

This unexpectedly high level of demand has been maintained for a sufficient length of time to demonstrate that it is no mere temporary ebullition and to make it reasonably certain that the industry will start its peacetime expansion from the point where it left off at the close of the war without the necessity of recovering any appreciable amount of lost-ground.

There has been much discussion of the petroleum position of the United States and its outlook at the end of a war which placed a heavy load upon its producing fields and involved the outturn of more than 6,000 million barrels in the four years ending with 1945. Opinions have ranged from pessimistic predictions of an early exhaustion of the country's oil resources to equally positive assertions that future discoveries will be far greater in the aggregate than those that have been made in the past, though admittedly greater effort and greater cost will be involved.

For the immediate future, regardless of long term results, an intensified search for oil will be carried on in the United States. During 1945, under the war created stimulus for more and more production 580 field crews, a record number, were engaged in geophysical surveys, involving an estimated expenditure of some $60 million while the number of exploratory wells drilled rose to a new high figure of 5,600. Of these just over 78 per cent were dry holes which represented a slight gain over the average of preceding years in the percentage of productive wells though the addition to reserves in proportion to the footage drilled was below the average of recent years with exception of 1943.

Since the close of the war the scope of exploration has been broadened to include the thorough testing of areas on which only desultory efforts had been expended. At the present time such exploration is being carried on in thirty-two states, extending from the extreme northwest to the southern tip of Florida. Development drilling in established fields has been accelerated in view of the clear indications of a continuing rise in demand and in order to relieve fields that were produced above their maximum efficient rate during the war. In the first half of 1946 well completions amounted to 1,250, a gain of about 10 per cent over the corresponding period of the year preceding. Completions of exploratory wells were roundly 2,000 or about the same as during the first half of 1945. Total wells drilled during the year may reach 30,000. Termination of price controls on petroleum products may encourage still greater activity.

Among other North American countries both Canada and Mexico are giving greater attention than at any recent time to exploratory activities directed to increasing their annual output of oil. In Canada the peak of production in the Turner Valley field was reached in 1942. Drilling of development wells will continue and will prevent any sharp falling off in total yield but experts foresee a slow decline from this time on in the average recovery per well. This situation is stimulating intensified search for new sources of production throughout the plains area of the western provinces. At present this activity is largely centered in northern Alberta. In this district several oil companies are undertaking a combined program of exploration known as "operation Muskeg" on which some $25 to $30 million is expected to be spent. The Lloydminster district of northern Saskatchewan is also attracting attention. Development there has been limited to shallow wells yielding low gravity crude but deeper tests are projected to determine the potentiality of the field.

Exploration and drilling have been held to a minimum in Mexico during the war years by lack of available equipment. Meanwhile domestic demand has risen rapidly. In order to supply this growing local consumption and to resume the export trade which was an important feature of the business in pre-war years, Petroleos Mexicanos is conducting geophysical surveys in the northern states and along the West Coast as well as in the Gulf Coast and Isthmus areas where the principal producing fields are located. Other drilling activities are contemplated looking to the extension of these fields. This is only part of a broad program of development which

Above. New houses for Arabian American employees at Ras Tanura. The houses are located on a Persian Gulf beach which provides excellent swimming for the Americans and their families.

Aerial view of the Arabian American Oil Company's headquarters' community at Dhahran, in the heart of the producing field of Dammam, where oil was first discovered in Saudi Arabia.

includes the building and relocation of refineries, the laying of pipe lines and the establishment of bulk storage plants intended to insure the better distribution of the increased production that is being sought.

Central America is in the preliminary stage of oil industry development. Nicaragua is the only country in which exploratory drilling is in progress but interest in the possible location of oil deposits is indicated by negotiations that are going on for concessions in other parts of Middle America. Guatemala recently adopted a new oil law intended to enlist outside capital and reports that two applications for concessions are under consideration. British Honduras several years ago granted an exploration permit to Shell interests under which only preliminary aerial surveys have been made, due to the intervention of the war.

In the West Indies exploratory operations, interrupted during the war, have been resumed in Cuba and the Dominican Republic. In the Bahamas six companies have taken concessions covering a large area in the shallow waters around the islands. Geophysical surveys are now in progress on some of these concessions and test drilling based on the results of these surveys will follow. In Trinidad also, where producing wells were pushed to the limit during the war to provide oil for military use, offshore areas have been marked for exploration.

South America is entering upon a period of exploration and development activity which extends from one end of the continent to the other and exceeds anything in its past history. The most extensive operations, naturally enough are being carried on in Venezuela where Allied military demands stimulated a 30 per cent rise in production and where exploration is being pushed by companies that obtained new or revised concessions under the petroleum law of 1943. Development work is rather evenly distributed between the eastern and western fields while wildcatting is going forward in numerous undeveloped areas in the central and southern states with between fifty and sixty rigs in operation.

The international companies operating in Colombia are extending the scope of their exploratory operations and the country's three producing fields of the DeMares, Barco and Yondo concessions are currently yielding upward of 68,000 barrels daily or about double the output of three years ago when production was cut back by wartime lack of transportation. In the Casabe field, a Shell development and newest of the three, which has been in active operation for the past year, production is nearing 10,000 barrels daily and new wells are being drilled on the proved structure. Work is progressing steadily on the company's second promising field, El Dificil, where No. 14 is approaching completion. Shell's most interesting wildcat operation is being carried out on its big Llanos concession where preparations are under way for its third deep test, San Mertin No. 3.

In the Barco, Colombian Petroleum Company is concentrating on the Tibu district where four deep tests are under way, one of them below 10,000 feet and the work is under way at ten other well sites. The Texas Company which is half-owner of Colombian is developing on its individual account a tract which it owns in fee simple in the upper Magdalena valley. Its first wildcat, Velasquez No. 1, is below 8,000 feet and preparations are under way for other deep tests at El Tablon, Pinto and Remolino.

The deepest hole in Colombia stood at 11,676 feet on July 20, and is being drilled in the lower Neagdaleua valley by Richmond Petroleum Company, subsidiary of Standard Oil Company of California. Other sites selected for drilling are located at Chorrea and Buena Vista.

Gulf Oil Corporation is another company that is engaged in exploratory work in Colombia with two wildcat tests, Sardinata No. 1 and No. 1 Zahino. Socony-Vacuum, with two producing wells in its Sinu field, has two more drilling with seven wildcats under way at Floresanto, Cantagallo and Las Monas.

With the necessity of deep drilling exploration in Colombia cannot proceed as rapidly as in some other areas but the confidence of responsible companies in the location of additional prolific fields is evidenced by the broad scale of present operais evidenced by the scale of present operations.

Ecuador has been an oil producer for many years but never on a scale comparable to that of its neighbors to the north and the greater part of its area has remained unexplored. At the present time more activity is getting under way. International Ecuadorian Petroleum Company is conducting exploration in the coastal area with three rigs at work. Shell holds a large concession in Eastern Ecuador, beyond the Andes on which one dry hole has been drilled and where other tests are in preparation.

Arabs who have worked for Aramco for ten years receive their service pins, presented by Floyd Ohliger, Aramco general manager. Other Americans, left to right, are J. MacPherson and J. T. Duce, Aramco vice-presidents.

A new policy toward the exploration of oil resources has been adopted in Peru where for several years the investment of foreign capital has been discouraged. A revised oil law has been drawn up and is awaiting approval by the Peruvian Congress. Once it is adopted it is expected that applications for concessions will be filed by a number of international companies. An agreement with the International Petroleum Company will give the latter authority to explore and develop an area of more than five million acres in Sechura desert adjacent to the company's Talara field which is believed to have reached the limit of its productive possibilities. In the opinion of geologists the most promising area for exploration in Peru is on the eastern slope of the Andes where one field already has been developed and it is here that concessions are expected to be most eagerly sought.

For several years the government controlled oil company of Bolivia, Yacimientos Petroliferos Fiscales Boliviano (YPFB), has had under consideration plans for expanding the production of Bolivia's small oil fields and installing refining and distribution facilities for meeting the country's domestic needs for petroleum products. During the war it was impossible either to obtain materials for the execution of these projects but immediately after the return of peace steps were taken to put them under way. Based on studies and estimates made by North American engineers it was decided to center the development of crude production in the Camiri field which was calculated to have known reserves of 20 million barrels considered to be ample to sustain the country's needs for a number of years. The plan called for the drilling of 29 wells estimated to supply a minimum average of 3,000 barrels daily. It provided also for the construction of a pipe line from Camiri to Cochabamba with an initial capacity of 3,000 barrels daily which could be raised to 12,000 by the installation of additional pumping units. Cochabamba was selected as the most convenient site for a refinery having in mind its facilities for the distribution of products by road and rail. Construction later of a second refinery at Sucre is contemplated.

Young Peruvian looks over International Petroleum Company refinery at Talara.

Although the discovery well that added Chile to the list of South American oil producing countries was brought in only at the end of last year the success of this initial effort aroused much enthusiasm in the country and is being followed by further drilling at sites previously selected. Discussion also has begun of a proposal for the construction of a 10,000 barrel per day refinery to process domestically produced crude which would be supplemented by imports from Peru or some other near-by point.

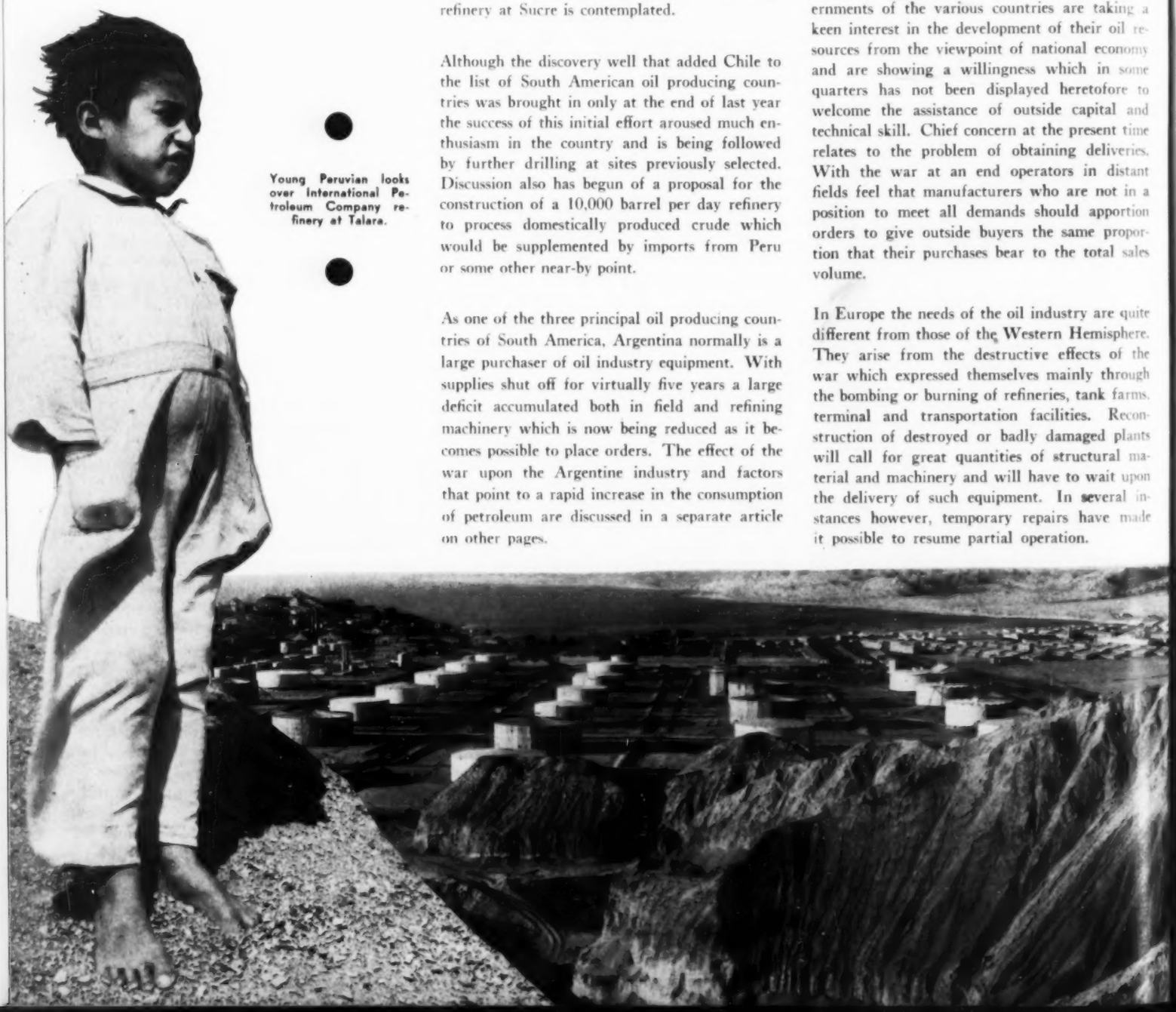
As one of the three principal oil producing countries of South America, Argentina normally is a large purchaser of oil industry equipment. With supplies shut off for virtually five years a large deficit accumulated both in field and refining machinery which is now being reduced as it becomes possible to place orders. The effect of the war upon the Argentine industry and factors that point to a rapid increase in the consumption of petroleum are discussed in a separate article on other pages.

Under a contract made last year between the Paraguayan government and the Union Oil Company of California a geophysical survey is being made of the vast and little explored Chaco district in the western part of the country. The first well to be put down in the area will be started shortly.

Brazil is another country that feels the need of more rapid development of its petroleum resources. With this in view suggestions have been advanced that outside capital and technical skill be permitted to share in oil production and refining which heretofore has been confined to Brazilian nationals. The National Petroleum Council now has under consideration a proposal for the licensing of refining companies under an agreement by which they will undertake to devote a certain percentage of their profits to exploratory work.

Not only is the range and volume of activity projected in South America greater than at any previous period in its oil history, but the governments of the various countries are taking a keen interest in the development of their oil resources from the viewpoint of national economy and are showing a willingness which in some quarters has not been displayed heretofore to welcome the assistance of outside capital and technical skill. Chief concern at the present time relates to the problem of obtaining deliveries. With the war at an end operators in distant fields feel that manufacturers who are not in a position to meet all demands should apportion orders to give outside buyers the same proportion that their purchases bear to the total sales volume.

In Europe the needs of the oil industry are quite different from those of the Western Hemisphere. They arise from the destructive effects of the war which expressed themselves mainly through the bombing or burning of refineries, tank farms, terminal and transportation facilities. Reconstruction of destroyed or badly damaged plants will call for great quantities of structural material and machinery and will have to wait upon the delivery of such equipment. In several instances however, temporary repairs have made it possible to resume partial operation.



Peruvian Government oilfield at Zirritos.

La Cira gas plant in the El Centro, Peru, field.

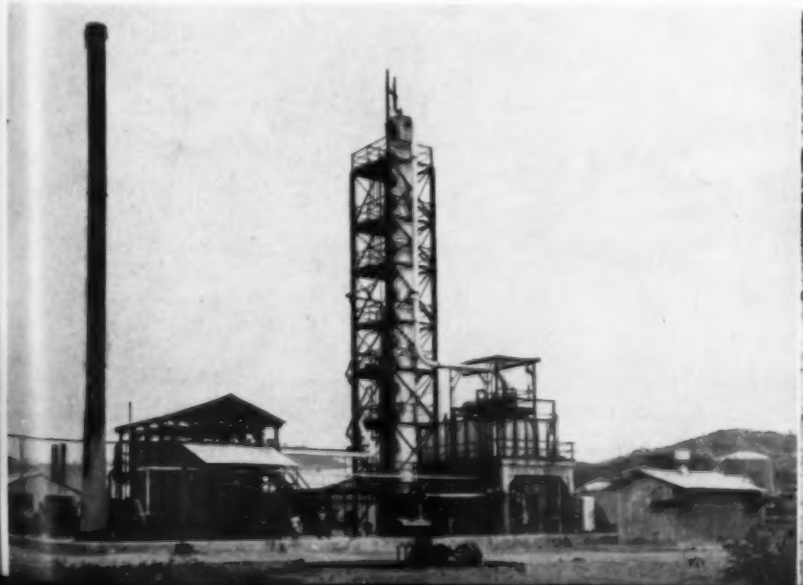
Russia and Romania, the two large oil producers of Europe, both suffered very serious losses in the war. Nazi invasion of the Soviet Union led to the destruction of a number of refineries including those at Odessa, Sevastopol and Krasnodor and to the practical demolition of the Maikop and Grozny fields. According to official statements 3,000 wells with an annual production of 35,000,000 barrels were destroyed either by the Germans or by the Russians themselves in futherance of their "scorched earth" policy. These losses, combined with inability to keep up normal drilling activity, brought about a considerable decline in Soviet production. In the absence of authoritative figures it is estimated by outside observers that crude production in 1944 dropped to about 140 million barrels as compared with a reported output of 217 million barrels in 1940.

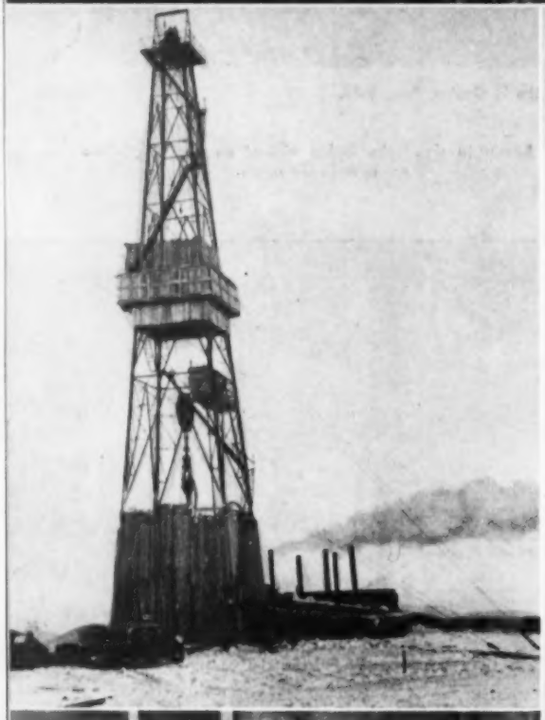
To offset this decline and to supply the products urgently needed for Russia's industrial recovery an energetic drilling campaign has been undertaken in the Baku district and in the newer fields of the Volga-Ural area along with extensive exploratory activities both in European and Asiatic Russia. The goal set by the five-year plan made public earlier this year is an output of 420 million barrels in 1960. To accomplish this objective Russia is establishing plants to fabricate certain oil industry goods but also is seeking to make large purchases of drilling machinery and refinery equipment in the United States and elsewhere.

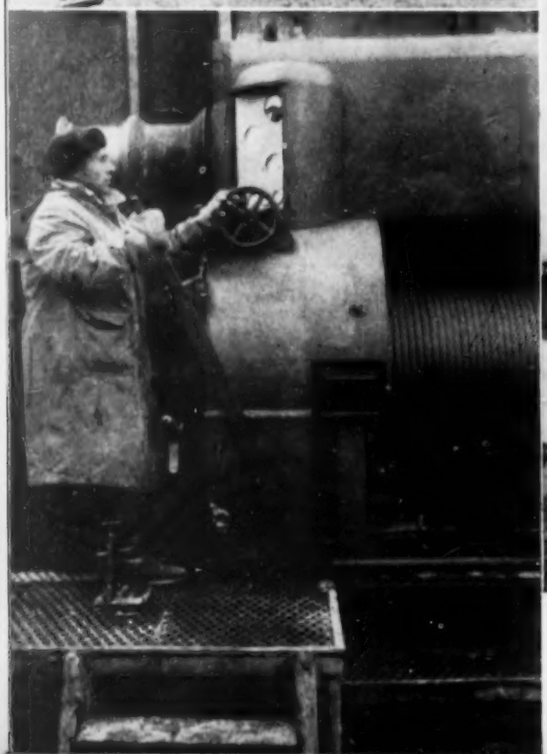
In international oil circles special interest always has attached to the Romanian oil industry because of the large proportion of its output that was exported, approximately two-thirds of the total production going to foreign markets. Even before the war production revealed a declining trend and the yield of the 200 or more wells drilled annually showed a decline of five to seven per cent annually from 1938 on. This rate of decline continued at an accelerated rate during the war years.

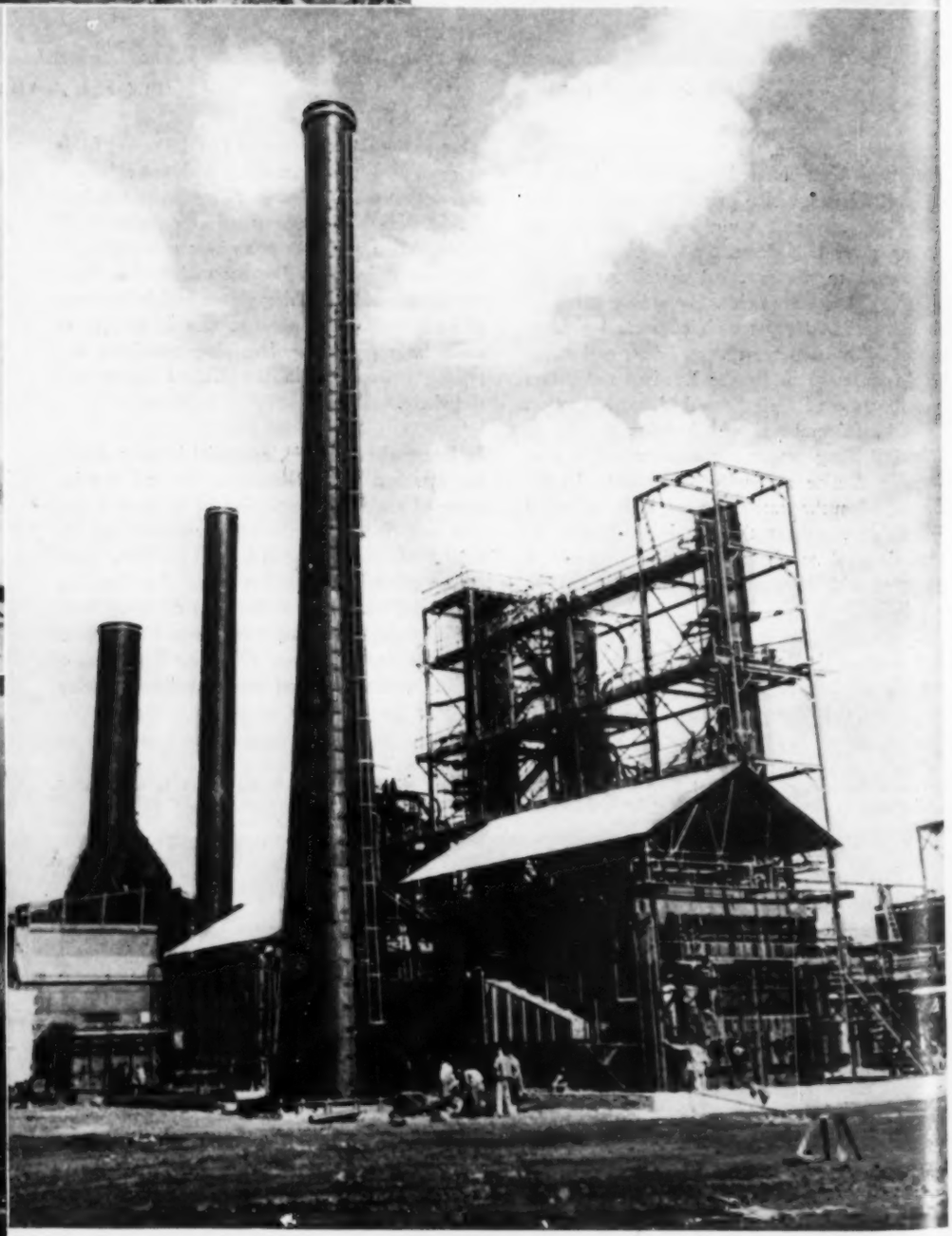
Ready to shoot the Galan wildcat on the Magdalena river in Colombia.

Peruvian government refinery at Zorritos pictured beside remains of refinery built in the 1850's to refine pitch. All photos on these pages by Collier for Standard Oil Co. (N. J.)









Above. Kuibyshev refinery built by Russians during the War. Left. Drilling in the Soviet Russian arctic region. Photos by M. Tsirulnikov for Sovfoto.

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Camp and refraction setup in Magdalena valley. Geophysicists and their helpers often worked up to their waists in water. Three miles an hour was good traveling time. Photographs by S. E. Lane for Seismograph Service Corporation.

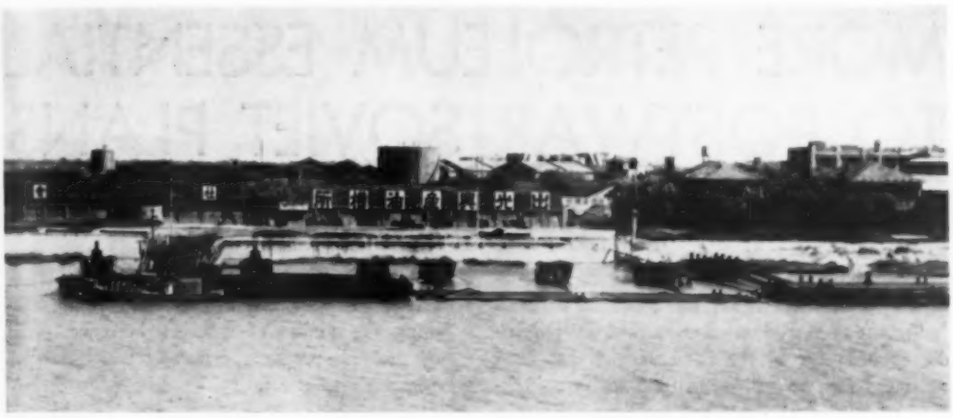
Under German domination efforts were made to maintain total output by increasing drilling by 36 percent but the resulting gain was only 212,000 tons in 1942 and was followed by a loss of seven per cent in the following year. The low point in production was reached in 1944 when it fell to 3,525,000 tons, influenced by the systematic attacks of Allied bombers which began in the early part of that year. Following the armistice in August 1944, a rise in production took place bringing it up to 4,640,000 tons (32,500,000 barrels) in 1945 which, however, was still only 74 percent of the 1939 figure.

To cover domestic requirements and restore the export business to anything like its former proportions a decided increase in exploratory drilling will be necessary. But this will require large imports of drilling and other equipment which in turn calls for a large amount of working capital. This will hardly be forthcoming under present conditions since the country is suffering from a bad case of inflation and the price of crude as fixed by the government is far below the actual cost of production. The oil producers' association has asked for a fivefold increase in price. Some increase probably will be granted in order to permit producers to remain in business.

In the Middle East production in Saudi Arabia has been increased to 180,000 barrels daily and is expected to continue its growth in view of the strong demand prevailing in Eastern markets. The drilling force of Arabian American Oil Company is being augmented by additional crews. Oil from Kuwait is now beginning to move into channels of distribution. Enlargement of the Iraq pipe line is making progress as scheduled and will provide an outlet for three times the present production of the Kirkuk field by 1948. Arrangements for right-of-way for the Trans Arabian Pipe Line from the Persian Gulf to the Eastern Mediterranean are virtually complete but no date has been announced for the construction of the line, though the preparations made should dispel any remaining doubt that it will be laid when production is sufficient to fill it. All these developments indicate that the long predicted assumption by Middle East oil of a prominent place in the international oil picture is at hand and that the expansion of producing and refining facilities in this area will continue.

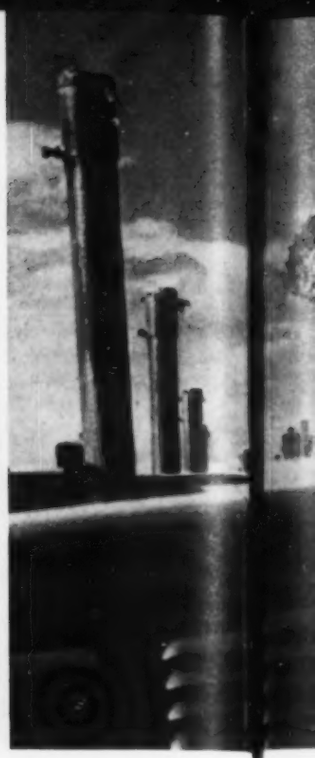
In the Far East where Japan held control of practically all oil territory for upward of three years the problem before the owners on regaining possession was threefold: first, to reassemble their working forces many of whom had been killed or had died of privation; second, to make temporary repairs that would permit partial operation of plants; third, to undertake permanent reconstruction of plants, to clean or redrill damaged wells and to resume exploratory work interrupted by the invasion. Where reoccupation followed on the heels of the retreating enemy it was necessary to have working crews assembled to accompany the occupation troops. In Miri and Sarawak, for example, the Japanese blew up all major installations and set fire to the wells before they pulled out. By prompt action much equipment was salvaged and the fires were extinguished with a minimum of damage. At Tarakan it was possible to resume production on a limited scale within a few weeks while at Balik Papan virtually a full year was required before the refinery could resume deliveries. In Java and Sumatra the continuance of desultory fighting made it difficult even to visit the fields and plants and to determine the amount of reconstruction needed until many months after the date of official surrender. Except in cases where plants were totally destroyed, as was the fate of the refineries near Rangoon in Burma, operations are proceeding on a temporary basis while waiting for the equipment needed to put them in full working order. Considerable delay has attended the resumption of exploratory operations since the working forces have been scattered, many have become casualties and records have been lost or destroyed. In the aggregate the restoration of the industry in the Pacific area will require a heavy expenditure and the installation of much new equipment but this work necessarily will be spread over a considerable period as materials and transportation become available.

While this review of conditions necessarily deals only with a small part of the work projected or under way in the various parts of the oil industry, it may serve to indicate the wave of expansion that is making itself felt everywhere and the unprecedented degree of activity that is under way in all parts of the world in preparation for the heavier demands that the industry will be called upon to meet in the new era of progress on which it is entering.



↑ Standard and Shell bulk plants at Shanghai are back in their owners' hands.

↓ Construction at a Mexican refinery.



Mikhail Andrianovich Evseenko, Soviet minister for the eastern oil regions.

Alexandr Zademidko, minister of construction of the fuel industry enterprises of the USSR.

MORE PETROLEUM ESSENTIAL TO POSTWAR SOVIET PLANS

By ALEXI VASILYEV, A. ANDROVNOV and ALEXANDER ANATOLYEV

OIL is so essential for the economic development of a modern country that the Oil Industry Ministry of the Soviet Union has been separated into two divisions, one to have jurisdiction in the oil fields and enterprises of the western and southern districts, and the other in the eastern regions. The Ministry was established many years ago and with time had become so cumbersome and unwieldy that the subdivision was necessary in order to bring management closer to the enterprises. This will enable the ministries to keep in close touch with every activity of the oil industry and to solve all urgent problems as they arise.

The demand for oil will rise sharply in Russia in consequence of the large projected development of the automotive industry and the increase in the output of tractors and internal combustion engines working on oil. If nothing unforeseen intervenes by the end of the new Five Year Plan annual production, by 1950, will include 428,000 trucks, 66,000 passenger cars and 6,400 busses. In addition, the yearly production will have been raised to 112,000 tractors, 18,000 combines and 165,000 cultivators and sowing machines.

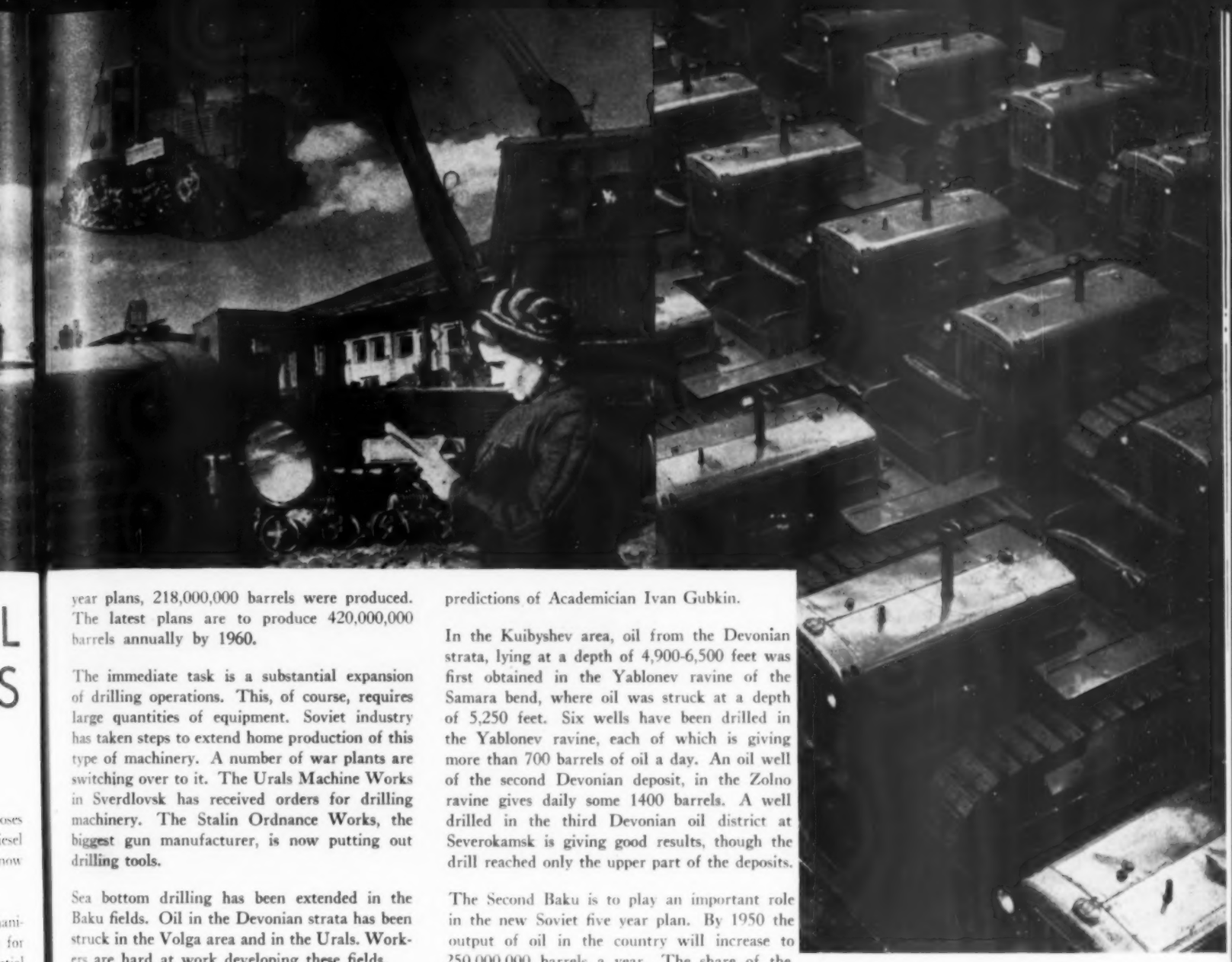
Along with this projected increase in the use of oil-consuming transportation and agricultural machines, production will start in the near future on diesel trucks, as well as on an annual output of 300 diesel locomotives. This volume of production of oil-consuming vehicles presupposes raising the quality of gasoline, kerosene, diesel fuel and oil products generally which is now being put into effect.

The expansion of the oil industry is also a manifestation of the concern of the Soviet Union for its security. Oil is one of the most essential strategic raw materials, and in these days it figures in the settlement of certain international problems. It should be recalled that one of the factors that insured the victory of the Soviets in the war was a well developed oil industry.

The new program for the sweeping development of the oil industry is based upon the huge resources available to the Soviet Union. The USSR holds first place among the countries of the world in the extent of its oil reserves.

Old Russia had only one oil producing area, the Baku fields. On Soviet initiative the development of a second area between the Volga and the Urals was started. This is now known as the Second Baku. Output of oil in this area rose several times over in the course of the war. Production of oil has been launched in Kazakhstan, Uzbekstan, Turkmenia, Georgia and the Far East. All these fields have large potentialities.

In 1913, only 63,000,000 barrels were produced. In 1940, after the completion of the original five



Left above—Russian streamlined locomotive. Above—Altai tractor factory. All photographs by Sovfoto.

year plans, 218,000,000 barrels were produced. The latest plans are to produce 420,000,000 barrels annually by 1960.

The immediate task is a substantial expansion of drilling operations. This, of course, requires large quantities of equipment. Soviet industry has taken steps to extend home production of this type of machinery. A number of war plants are switching over to it. The Urals Machine Works in Sverdlovsk has received orders for drilling machinery. The Stalin Ordnance Works, the biggest gun manufacturer, is now putting out drilling tools.

Sea bottom drilling has been extended in the Baku fields. Oil in the Devonian strata has been struck in the Volga area and in the Urals. Workers are hard at work developing these fields.

The so-called "Second Baku" base occupies an immense territory. With its northernmost part in the Krasnokamsk and Molotov districts, the Second Baku embraces the Votkinsk, Sarapul, Tuimazov, Bugulmy, Sterlitamak, Ishimbayev, Buguruslan, Stavropol, Syzran and Kuibyshev districts, and stretches in its southernmost area along the Saratov-Uralsk line. During a mere five years several large oil districts were established. The oil reserves of the Second Baku are estimated at 19,200 million barrels. By its geological structure the oil district resembles the Pennsylvania oil field in the U.S.A.

In 1938 the output of oil in the Second Baku amounted to 90,000,000 barrels. In recent years oil bearing strata, including Devonian deposits, have been discovered which have considerably increased the oil reserves of the region. Devonian oil found in many places, at considerable distances from each other, gives ground for assuming that new oil sources will be discovered in the near future. These discoveries confirmed the predictions of Academician Ivan Gubkin.

In the Kuibyshev area, oil from the Devonian strata, lying at a depth of 4,900-6,500 feet was first obtained in the Yablonev ravine of the Samara bend, where oil was struck at a depth of 5,250 feet. Six wells have been drilled in the Yablonev ravine, each of which is giving more than 700 barrels of oil a day. An oil well of the second Devonian deposit, in the Zolno ravine gives daily some 1400 barrels. A well drilled in the third Devonian oil district at Severokamsk is giving good results, though the drill reached only the upper part of the deposits.

The Second Baku is to play an important role in the new Soviet five year plan. By 1950 the output of oil in the country will increase to 250,000,000 barrels a year. The share of the eastern districts in the total oil output of the USSR will increase from 12 per cent in 1940 to 36 per cent in 1950, and in the Volga districts the output in 1950 will be 11 times greater than it was in 1940.

The oilfields of the Second Baku developed at a rapid pace during the war years. In the middle Volga, for instance, the Kuibyshev oil fields increased output three and a half times during the war. Many new oil fields were opened. Extensive construction was launched. Within a brief space of time four new oil fields were organized, a gas industry established and two cracking plants built. Scores of working and prospecting wells were sunk at the Tuimaza oil fields, the Naryshevo-Urussy oil-pipe line and large oil reservoirs were built. An electric power station, oil-pipe lines and a water supply were under construction.

In the next five years the new oil region will acquire still greater significance in the economy of the country. By 1950, compared with 1940, the output of oil in the Volga districts will increase eleven-fold, and in the Ural Districts 3.2 times.

Geological exploration and preparations of new oil-bearing areas will be conducted on a large scale. These works should ensure further growth in the output of oil and provide by 1950 industrial reserves sufficient for no less than two or three years ahead. High speed methods of sinking wells and turbine drilling will be extended.

A big building program will have to be carried out to ensure the realization of this plan. On the oil fields of Bashkiria, in the Volga area and Molotov region, new compressor stations, oil reservoirs, oil pipe lines, gas pipe lines and oil refineries will be constructed and new roads laid. A number of well-appointed workers' villages are to be built.

Much equipment and many drilling tools are required for sinking wells. In the second half of

last year a number of plants in the Urals started the manufacture of equipment for the oil fields of the Second Baku. The Urals Machine-Building plant is producing heavy drilling machines with Diesel engines for sinking deep wells. Ordnance factories are manufacturing mud pumps and other drilling equipment.

New manufacturing plants are under construction for supplying the refining industry with equipment including machinery, towers, vessels and instruments. Thus, in Kuibyshev a plant is being built with a productive capacity of 150 heavy drilling machines per annum, and in Stalingrad a plant for the manufacture of metal structures.

The youngest districts of the Second Baku started producing oil only between the end of 1944 and the beginning of 1945. The oil districts are scattered over hundreds of kilometres and occupy large areas. And prospecting, the building of necessary structures and new workers' hamlets, are proceeding in all of them.

The oil workers of the Second Baku are successfully applying new methods of drilling. Thus, in the Zhiguli oil fields, where the petroleum lies at a great depth under the hills, directional drilling is applied from the foot of the hill, instead of from the top, as was done at first. This new method lowers the cost and raises the speed of the drilling.

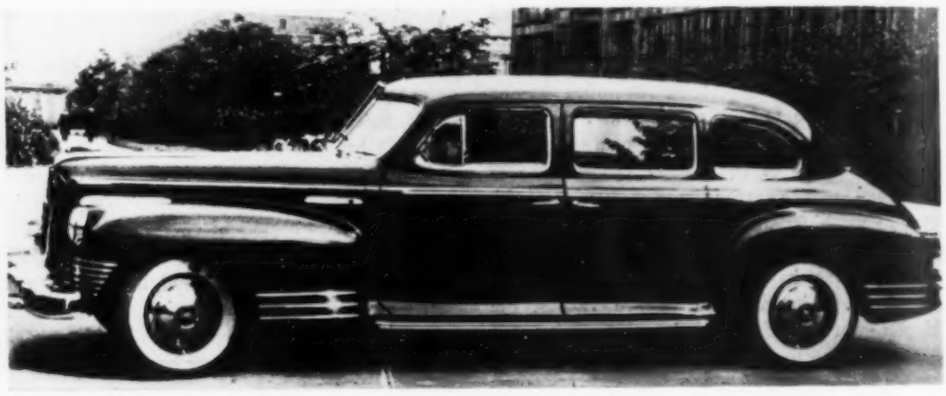
As a result of prospecting and construction, which was especially intensified during the war, Baku, Maikop, Grozny and the Carpathian oil fields acquired strong rivals in the new oil centers which have been built up in the East. Whereas 83 new deposits were discovered in the Soviet Union during the two prewar decades, 34 oil and gas deposits were added during the four war years and hundreds of promising new locations have been surveyed for future prospecting.

Second in importance in the development now getting under way is the Volga district, the Kuibyshev region and the Samara Bend, where wells are being drilled in the Zhiguli hills. Within a short time four new oil fields have been put into operation in the Kuibyshev section, the production of gas has been organized and two cracking refineries built. The region has effected a five-fold increase in the production of oil compared with the pre-war volume, and the future holds out still greater promise.

An oil center is being built also in the Urals (Molotov region, around Krasnokamsk and Severokamsk). At the end of the current year the oil fields in the Kama basin are expected to effect a 50 per cent increase in production, and an increase of about 3.5 times by 1950.

Major developments have also been made in the Central-Asian oil districts, notably in the fields directed by the Kalinin Oil Trust which are concentrated in the main in the Uzbek republic.

"Victory" model car now being produced at the Molotov automobile plant in Gorky. N. Kapelyush Sovfoto.



Seven Passenger Soviet car produced at Stalin plant in Moscow. Production line at the Stalin plant assembling motors for the big 7-passenger car. Photos by S. Korshunov, Sovfoto.

Extensive prospecting is likewise conducted in Turkmenia and Kazakhstan. Special significance is attached to the development of the oil industry in the Far East. Of interest in this respect is the marked increase in the output of high-grade oil in Sakhalin, as a result of the prospecting program launched on the island.

Special construction offices established after the war have started large-scale construction activities in the oil districts of Bashkiria, the Volga region, Kazakhstan, Uzbekistan, Turkmenia, on Sakhalin and at other points, building compressor stations, storage plants, pipelines, water mains, power stations, railways and roads, apartment buildings and cultural institutions in the new workers' settlements.

The length of the principal oil pipelines under construction exceeds 1,500 kilometers. Refineries are being restored in the liberated districts and new ones built.

CONTINUING SEARCH FOR OIL IN BRITAIN

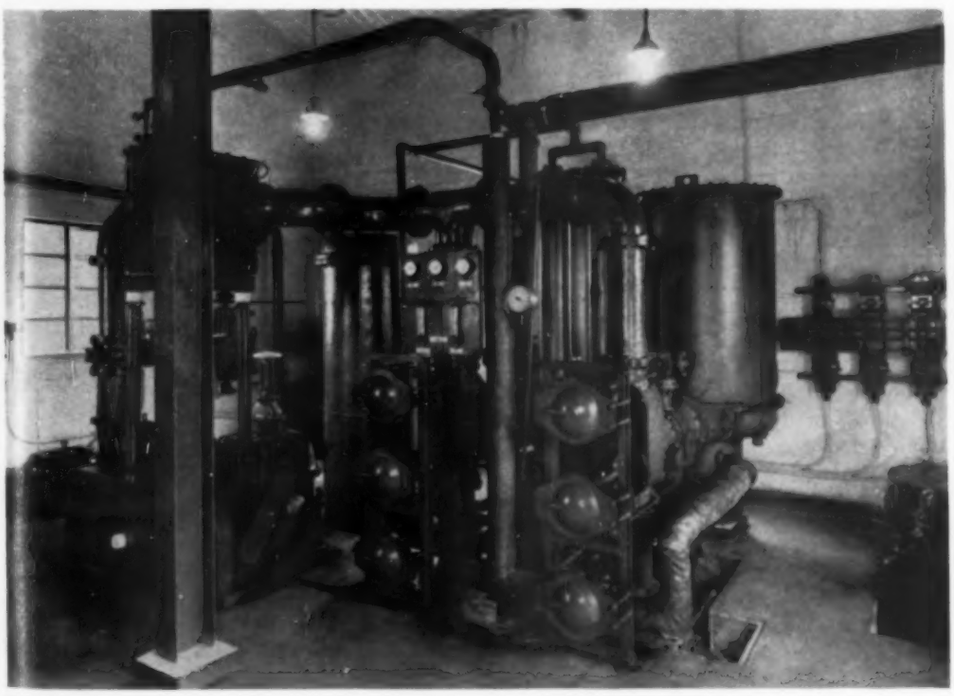
By ALEC H. DAY

WAR-TIME conditions in Britain were not conducive to an intense exploration of the country's oil resources. Supply difficulties affected drilling materials in common with all other goods and commodities, there was a serious shortage of manpower, and the nation's energies were naturally concentrated on the immediate task of carrying on the war. Nevertheless the need for developing an indigenous petroleum supply was considered a sufficiently high priority to insure encouragement from government departments, and the two oil companies mainly engaged in the search put both energy and persistence into their operations. The end of the war found them making fresh prospecting plans. Licenses covering large new areas have been taken out this year to replace those already prospected and surrendered.

Britain's search for petroleum under her own soil did not start in earnest until the passing of the Petroleum Production Act of 1934. This act nationalized oil rights but provided for the grant of exploration licenses over substantial areas. Its most important advantage from the prospector's viewpoint was that it eliminated the formidable handicap of having to deal with many individual landowners on questions of royalty payments.

Pumping well in a British meadow.

Adsorption plant processing natural gas in a British field. Photos courtesy Anglo Iranian Oil Co., Ltd.



Exploratory drilling started almost immediately after the act had been passed, with applications for licenses concentrated mainly on areas of southern England, particularly Sussex and Hampshire. In 1935, Anglo-American Oil Company (New Jersey Standard Group) was allotted prospecting rights covering 478 square miles. January 1936 witnessed a first drilling at Portsdown, Hampshire, by D'Arcy Drilling Company, the Anglo-Iranian subsidiary. By March 1939, licenses totalling 14,797 square miles had been issued, of which 11,385 square miles were then held, the remainder having been relinquished after preliminary investigation or actual boring. Holders of the licenses were:

	Sq. Miles
D'Arcy Exploration	7,163
Anglo-American	2,364
Gulf Exploration (Great Britain)	1,508
Steel Brothers & Co. Ltd.	350
	11,385

Gulf Exploration (Great Britain) at one time held licenses over nearly 2,000 square miles. It drilled a deep test well at Penshurst, Kent, and a second well in the Cleveland Hills area, Yorkshire, in 1940-41, with negative results in each case. The company subsequently surrendered all its licenses, and has no present plans for re-entering the British prospecting arena.

Steel Brothers and Company, whose association with oil arises primarily from their position as managing agents in London to the Attock Oil Company operating in India, completed a test well at Eadle, Derbyshire, in 1938, and then carried out a general survey of licensed areas in Yorkshire, Derbyshire, Cheshire and Lancashire. A boring was eventually put down in Derbyshire, not far from the site of the original test well. This second well was abandoned at 2,555 feet in 1941 owing to the unpromising rock structure encountered, and the company has since surrendered its licenses.

It was thus left to D'Arcy Exploration and Anglo-American, the two concerns that had been most active from the outset, to continue the oil search. The quest seems to have followed a definite geographical pattern, moving first to the north and then southward again. The first objectives were certain prominent anticlines in southern England, but results from the country chosen were negative. Attention was then diverted to North Yorkshire and Scotland, but

Portable drilling unit in Britain. ↑

Taking core samples from 7473-foot sand in Britain's deepest well. ←

meanwhile geophysical work had been carried out in Nottinghamshire and adjacent counties, and drilling tests have followed. More recently, a further move to the south has been made, to districts not covered by previous prospecting.

D'Arcy Exploration's most important work during the war was the development of the Eakring oilfields in Nottinghamshire. The productivity of this territory was discovered in 1939 by the normal modern methods of exploration. An analysis of data derived from coal exploration and working indicated the prospect of an anticlinal structure. This was confirmed on a geophysical survey by seismic methods and subsequently by boring, oil being encountered at 1912 feet in a sandstone in the Millstone Grit formation.

Almost coinciding with the outbreak of war, this discovery had a wide influence on the D'Arcy Exploration's immediate drilling program. The policy was adopted in the national interest of concentrating on the point at which actual production had been obtained. Drilling on the more speculative areas was suspended and the drilling outfits scattered over these areas were transported to the Eakring fields. Many difficulties were met at first with the equipment thus assembled. The outfits were relatively heavy, having been purchased originally for deep drilling to 8,000 feet, and were unsuited to rapid drilling of the depths of between 2,000 and 2,500 feet required at Eakring.

Progressive improvements were obtained in drilling technique after a time, and in 1942 the company obtained new drilling outfits from the United States, with the benefit of valuable American co-operation. The new outfits consisted of unitized rigs with jackknife portable derricks, designed to give maximum mobility and to drill to 5,000 feet with 4½ inch drill pipe. The result was a great speed-up of drilling and an equally impressive reduction in moving-time between one site and another. A record summertime move of 6½ hours was established, and an outfit was on one occasion moved and had drilled 960 feet at its next site within 24 hours.

General characteristics of the fields from which the greater part of Eakring production has been obtained are described by the Anglo-Iranian Oil Company as follows: "Each oilfield consists of a simple domal structure with some minor faulting, containing a number of separate and independent oil-sands: the thickest of these, the Rough Rock, a hard sandstone, varying from 50 to 100 feet in thickness, is the main producing horizon in the chief oil field. In this field, which is two miles long by half a mile wide, four separate oil-sands yield production in the central part of the structure, whereas in the smaller fields only two oil-sands are present, and these are thinner, being about 30 feet thick with a shale break of 70 feet. Each sand has its own particular type of crude oil and edge-water. These oil horizons lie mainly in the Millstone Grit Series of the Upper Carboniferous Limestone, but they extend upwards into the Lower Coal Measure Sandstones."

The crude obtained is of a mixed type, with a paraffin wax content more than double that of an average Mid-Continent crude, but with a low sulphur content. Motor and aviation gasoline distillates are of mixed types with naphthenic characteristics predominating and high octane numbers. High-grade lubricating oils can be prepared from the crude, comparing favorably with those from Mid-Continent production.

Pumping units have had to be installed at each well on completion. Tubing sectional liner pumps are used, the standard pump being 5 ft. x 2 in. x 1¼ in., run on 2-inch plain tubing and operated by ⅝-inch sucker rods, pumping jacks being operated by individual electric motors.

Including the Eakring fields and all other areas prospected, D'Arcy Exploration has drilled, according to the latest available figures, 735,000 feet in 380 wells, and has brought in 250 producers. Production to date—practically all from the Eakring district—is over 400,000 tons, but output has recently been declining, that for 1945 being 71,542 tons.

Meanwhile the company is continuing its search for fresh producing areas. It holds licenses covering well over half the total area of those granted to it since the passing of the 1934 Act.

Prospecting operations of Anglo-American, although not as successful as those of D'Arcy Exploration from a production viewpoint, have been no less energetic. By the end of 1937 this company had transferred its main search from southern England to Yorkshire and the Midlothian district of Scotland. In 1940 it took licenses over areas in South Wales and Cheshire. Every known method of geological and geophysical examination has been employed by this company at one time or another—with Anglo-Iranian co-operation in some phases of the work.

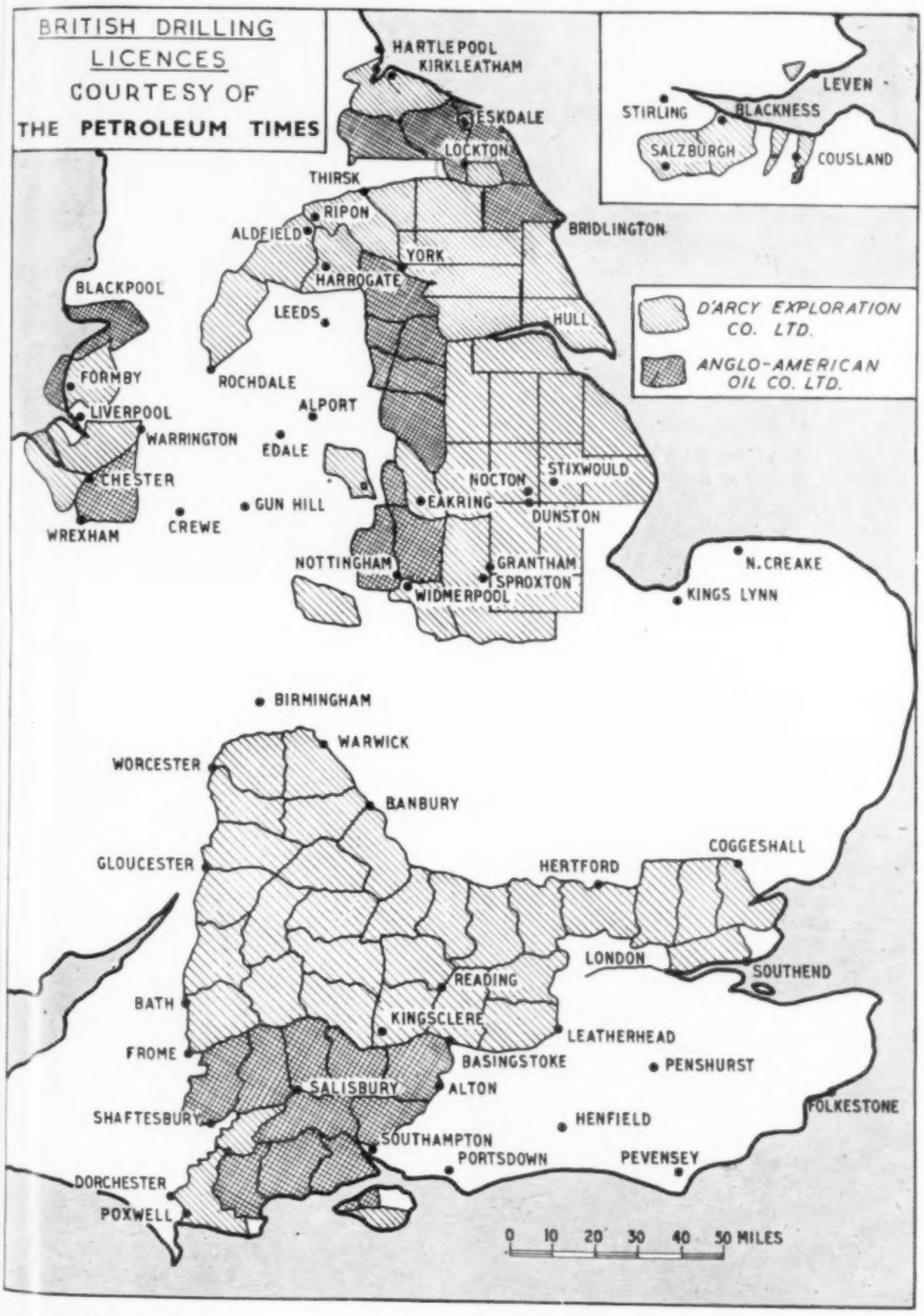
The most successful oil production was achieved in Midlothian, where after reaching 3,827 feet

one of the company's wells was plugged back to make a small pumping producer in a sandstone at 1,728 to 1,760 feet. This area failed to live up to its early promise, further drilling demonstrating unusually irregular geological conditions with a disappointing volume of pooled oil, although small quantities of crude are still being produced there.

Anglo-American has since transferred its main drilling work to the Yorkshire-Nottinghamshire area where favorable geological indications had been partially confirmed by the discovery at Eakring. Shows of oil have been met in this new territory at times, but nothing of commercial value has so far been discovered.

In the summer of 1945 the company completed a test well at Belton, in peat country in the Doncaster district at 5,459 feet. Geophysical work had indicated a dome giving encouraging prospects of oil accumulation, and the drill disclosed traces of light oil. But this was not found to be in commercial quantities, and an examination of cores showed the oil productive strata of the Nottingham area to be lacking at Belton.

The company's latest effort is at Gringley, some 12 miles south of Belton. This well is now down to over 5,000 feet, and if not productive, is expected to give important guidance on the direction of further prospecting.



Although its main drilling activities have recently been in central and northern England, Anglo-American has been turning its attention again towards new areas in the south. It has within the past few months been granted licenses covering 1,246 square miles in Wiltshire, Dorset, and Hampshire, including parts of Salisbury Plain and the New Forest, and geophysical examination of these areas is now in progress.

Despite the small production of high-grade crude from the Midlothian field, the company's extensive work has so far achieved little success. But the company still has a large area to cover, and its management, realizing the immense amount of work still to be done, is continuing the search as vigorously as ever.

The following table summarizes British prospecting licenses granted from the passing of the Petroleum Production Act in 1934 up to September 1, 1946, and the present state of licensed areas.

Company	Total Area Licensed Square Miles	Total Surrendered Sq. Miles	Total Area Still Held Sq. Miles
D'Arcy Exploration	19,326	7,726	11,600
Anglo-American	7,272	3,310	3,962
Gulf Exploration (G.B.)	1,960	1,960	nil
Steel Bros. and Co.	350	350	nil
	28,346	13,346	15,562

Regarded from a commercial angle and in relation to the extensive work done during the past twelve years, the results of oil prospecting in Britain appear uneconomic. Nevertheless, the small production obtained by D'Arcy Exploration at Eakring has been officially rated as a valuable addition to British oil supplies, at a time when war requirements were most pressing and the means of importing petroleum were severely restricted by the submarine campaign.

As a source of information on the country's coal resources, the oil search has also a great value. Oil borings, particularly in Nottinghamshire and Yorkshire, have frequently been located in coal areas. The prospecting companies have had close cooperation from the coal interests concerned, as well as from the Coal Commission. Conversely, their work has provided a great deal of additional knowledge on coal geology. Many of the wells have been drilled with coal representatives on the site, collecting coal samples from the mud-flush and observing any soft strata penetrated by the drill.

Thorough examination of Britain's oil potential has also been of great national advantage from the viewpoint of general geological knowledge. This new information may prove quite as important as any other result achieved, since it seems to have helped to arouse public and official interest in a further examination of Britain's mineral wealth. A Government Committee was appointed in Britain in August 1746 to undertake an exhaustive inquiry into mineral resources with the exception of coal and oil.

POST-WAR GROWTH OF ARGENTINA CALLS FOR NATION'S OIL INDUSTRY EXPANSION

By ING. BERNARDO RIKLES

IN REVIEWING oil industry activities in Argentina during the war period credit must be given to the men in charge of refineries for their ingenuity and zeal in keeping plants in operation without receiving replacements of equipment and materials—especially alloy steel the manufacture of which had never been locally undertaken. Argentine foundries and shops manufactured for the first time high temperature and pressure valves and fittings, as well as pumps, electric motors and centrifugals, using more than once as raw material worn out still tubes and other available discards from refinery scrap piles.

Mention must be made further of Yacimientos Petroliferos Fiscales for sharing part of its crude production with local refiners, who were thus able to keep their plants running and of the three large oil concerns operating in Argentina: Compania Nativa de Petroleo S.A., Diadema Argentina S.A. and Ultramar Sociedad Anonima Petrolera Argentina, who pooled their production and distributed it in proportion to refinery capacity.

The supply of petroleum products during the period began declining in 1942 when stocks of native and imported crudes started dwindling and petroleum transportation with foreign tankers, which carried the greatest proportion of the nearly four million barrels per year of imported light crudes refined in Argentina, was completely cut off.

In an effort to offset the reduction of available crude for refining, YPF, for the first time in its history began to import crude from Bolivia and Ecuador, assigning one of its fastest tankers, the "13 de Diciembre," with a capacity of 74,000 bbl., to the transport of Ecuadorian crude. In addition, when local conditions permitted, it sent other tankers to bring kerosene and fuel oil from Aruba. Local transportation companies cooperated fully with YPF in leasing their barges and river tankers for transportation of fuel and other products from the refineries to the consuming centers.

Oil producers did their best to increase crude production, but the scarcity of pipe and drilling machinery, imports of which were cut off in 1941, made it difficult to increase wells in producing areas and to advance wildcat drilling. Some wildcat equipment had to be diverted for drilling new wells in productive areas; old wells were shut off and their piping and pumping equipment was used for new wells of larger production. These steps helped YPF to sustain production while private companies maintained theirs with little variation until 1944, when the total output began to decline and with it the crude run to stills.

20,000-barrel refinery of Cia. Nativa at Campana.

Despite the handicaps YPF continued exploration work and during this period discovered two important new oil fields, one at Caleta Olivia south of Comodoro Rivadavia and another at Challaco some 14 miles East of Plaza, Huincul, Neuquen.

After Pearl Harbor it was expected that the lack of tires and inner tubes and the reduction in available cars would compensate for the lower gasoline production and that rationing would be unnecessary. On the contrary, the number of registered cars increased and rationing of gasoline had to be imposed during the second half of 1942 and continued until the renewal of crude imports in December 1945.

During this period substitute fuels came into use. At the end of 1940 the special committee designated by the government to study the possibilities of producing alcohol for motor fuel

Yacimentos Petroliferous Fiscales refinery at la Plata. →

Combination cracking unit at Y.P.F. at Lujan de Cuyo (Mendoza) refinery. ↓

advised that an increase of one cent (Argentine currency) per liter of fuel for each 10 percent of alcohol from corn at $5.50 per hundred kilograms, was necessary. Work on the adaptation of gas generators to cars was entrusted to a special committee. Although some cars and trucks were equipped with gas generators the substitutes were not actually used and the petroleum industry had to carry the total burden of supplying the country's motor fuel requirements. The Office of Fuel Distribution under supervision of Yacimientos Petroliferos Fiscales with the cooperation of private companies, managed to maintain Argentina's industrial activities. Gasoline quotas for trucks, tractors and the like, which represent 80 percent of gasoline consumption in Argentina, were liberal; most of the restrictions were imposed on private car owners, who somehow managed to get the fuel they required in the black market.

Despite the reduction imposed on motor gasoline, production of solvents was increased because of the large development in the manufacture of edible and industrial vegetable oils.

The scarcity of residual fuel oil and distillate fuel oils was felt more intensively than that of motor gasoline. Wood, wood-charcoal, corn, wheat, bran, sunflower seed, flax seed, cakes from oil presses as well as linseed oil, were used as fuel oil substitutes to replace previous large fuel purchases. Imports during 1938-1939 ranged about three million tons of coal and about one million tons of fuel. With the exception of a small tonnage of fuel from Aruba and some coal brought mainly from USA and South Africa, foreign fuel supplies were practically cut off after 1943.

While rationing started in 1942 and production of the fuel oil was kept at a practically constant level at the expense of other products, stocks reached a very low figure in 1945 and heavy restrictions were imposed on the use of electrical energy by all classes of consumers.

Much of the burden of satisfying the requirements of petroleum products in Argentina fell upon YPF which maintained all of its six refineries at full capacity until 1944, when it stopped operation of its small plant at Campana, which was running to coke in shell stills and was equipped with obsolete installations erected in 1926-1928. One of the reasons for YPF's success in its refining enterprise is found in the expansion and modernization of its fuel manufacturing facilities just before the commencement of hostilities.

In 1938 it started operation of the 9,500 B/D refinery at San Lorenzo and at the end of 1939 it placed in operation a new 9,500-bbl. combination unit at La Plata refinery, increasing its capacity from 23,500 to 33,000 bbl. of crude per day.

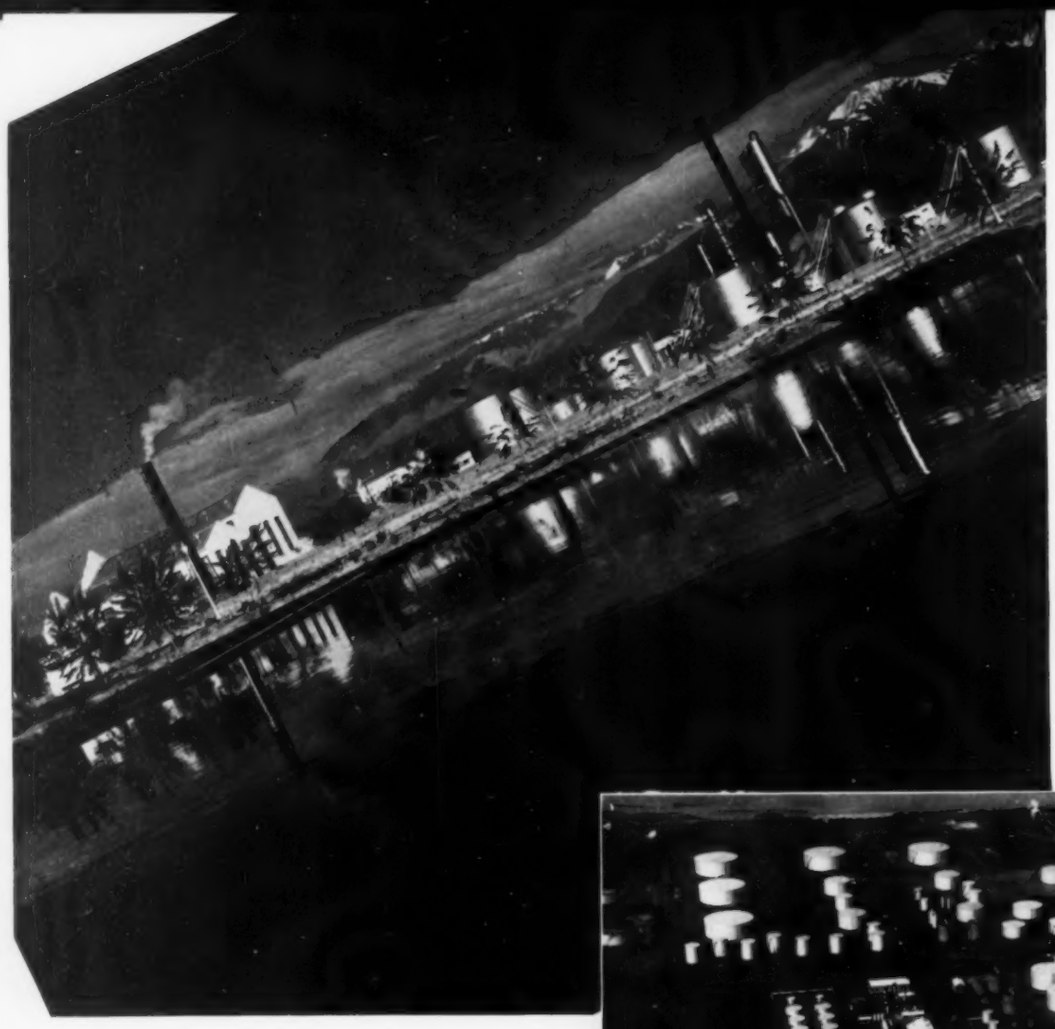
At the beginning of 1941, two new refineries were placed in operation; one at Mendoza with a daily capacity of 3,200 bbl. and another at Salta with a daily throughput of 2,000 bbl., processing crudes from Mendoza and Salta oil fields.

The discovery of Challaco sour crude in 1942 presented a new problem to Argentine refiners. Comodoro Rivadavia, Plaza Huincul, Mendoza, Salta and imported crudes processed previously were characterized by their low sulphur content and refiners lacked alloy equipment for handling crude with approximately two percent sulphur.

At first the Challaco oil was topped and the reduced crude sent to fuel or to asphalt after vacuum distillation; later on arrangements were made with Cia. Nativa to run it in a Tube and Tank cracking unit at Campana, provided with "chrome moly" tubes and gunnite protected towers, after a thorough desalting operation.

Some refineries had to adapt their units designed for light imported crudes to work with heavy Comodoro Rivadavia crude, and to manufacture lubricants from distillates rather than residuals for which their equipment was designed. Others, working with Peruvian low cold test had to change to Salta and Ecuador high cold test waxy crudes.

A small refinery developed a process for the manufacture of crystalline wax, the supply of which was very short, without the use of high



Despite the handicaps imposed by war, the future of oil refining in Argentina looks brighter than heretofore. The development of the country is in a positive upward trend and all conditions are favorable to its continuation in the future.

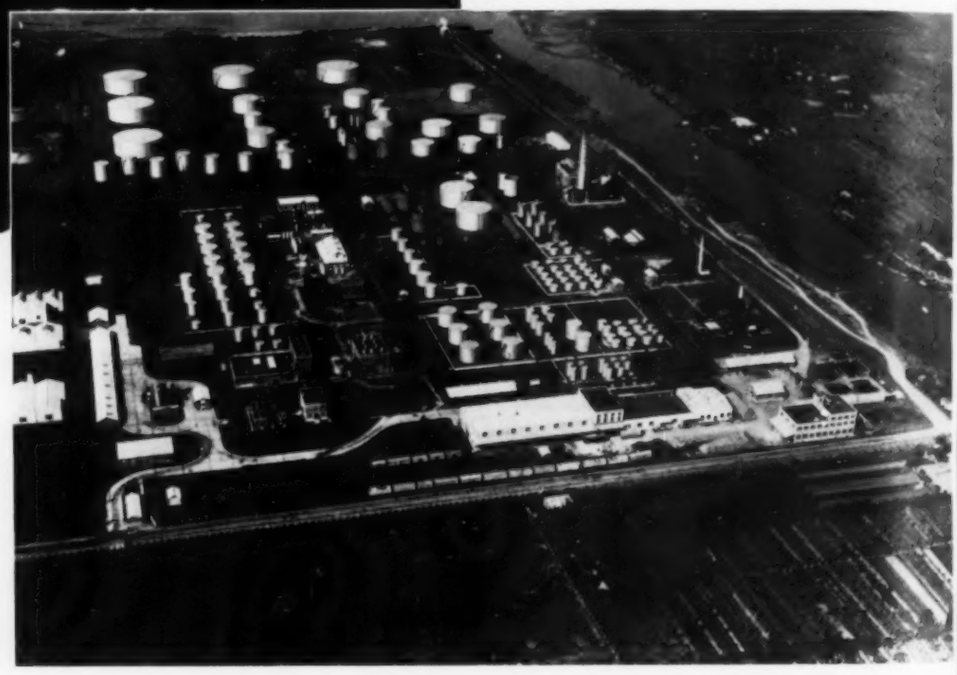
As shown below, national income showed a practically constant increase till 1944.

Growth of Income
(Millions of Pesos)

Year	Income	Year	Income
1937	8,050	1941	9,450
1938	8,070	1942	9,750
1939	8,630	1943	9,600
1940	8,620	1944	10,300
		1945	10,000

← General view of Y.P.F. refinery at Lujan de Cuyo (Mendoza) taken from water circulation pond.

Ultramar (Texac-Socony) refinery at Buenos Aires. This is a 5,000-barrel plant. ↓



pressure filter presses, and another managed to erect and put in operation a topping plant with a daily capacity of 630 bbl. designed and constructed completely in Argentina.

Besides supplying fuels and lubricants the oil industry in Argentina had to take care of the provision of tetraethyl lead, gasoline antioxidants, alcohol denaturants, lube oil pour-point depressants, raw materials for synthetic toluol and foundry coke. In 1943 YPF built and put in operation a pilot plant for the manufacture of the tetraethyl lead required to prepare 90 octane aviation gasoline. About the same period, because of very low stocks of gasoline inhibitors on hand, manufacture of alpha-naphthol was undertaken by a local chemical concern as a substitute for UOP and Dupont inhibitors used in the past for gasoline gum stabilization.

YPF's research laboratories developed special catalysts for the manufacture of toluol from a 95°C - 105°C boiling range cut obtained by straight distillation from Comodoro Rivadavia and Salta crudes. A synthetic toluol plant started operation in 1943 and is producing a good product for nitration purposes. The manufacture of isopropyl alcohol was begun in 1943 at the San Lorenzo refinery and a plant with a yearly capacity of 6,000 barrels of isopropyl alcohol from gases of a vapor phase cracking unit is at present in normal operation.

A process was developed by YPF for the production of foundry coke from petroleum coke and from wood charcoal. Another new undertaking was the manufacture of activated clays from Argentine bentonites for lube oil treating. The production of white oils for industrial and medicinal uses was expanded to satisfy the demand for these oils previously imported from Germany and the USA.

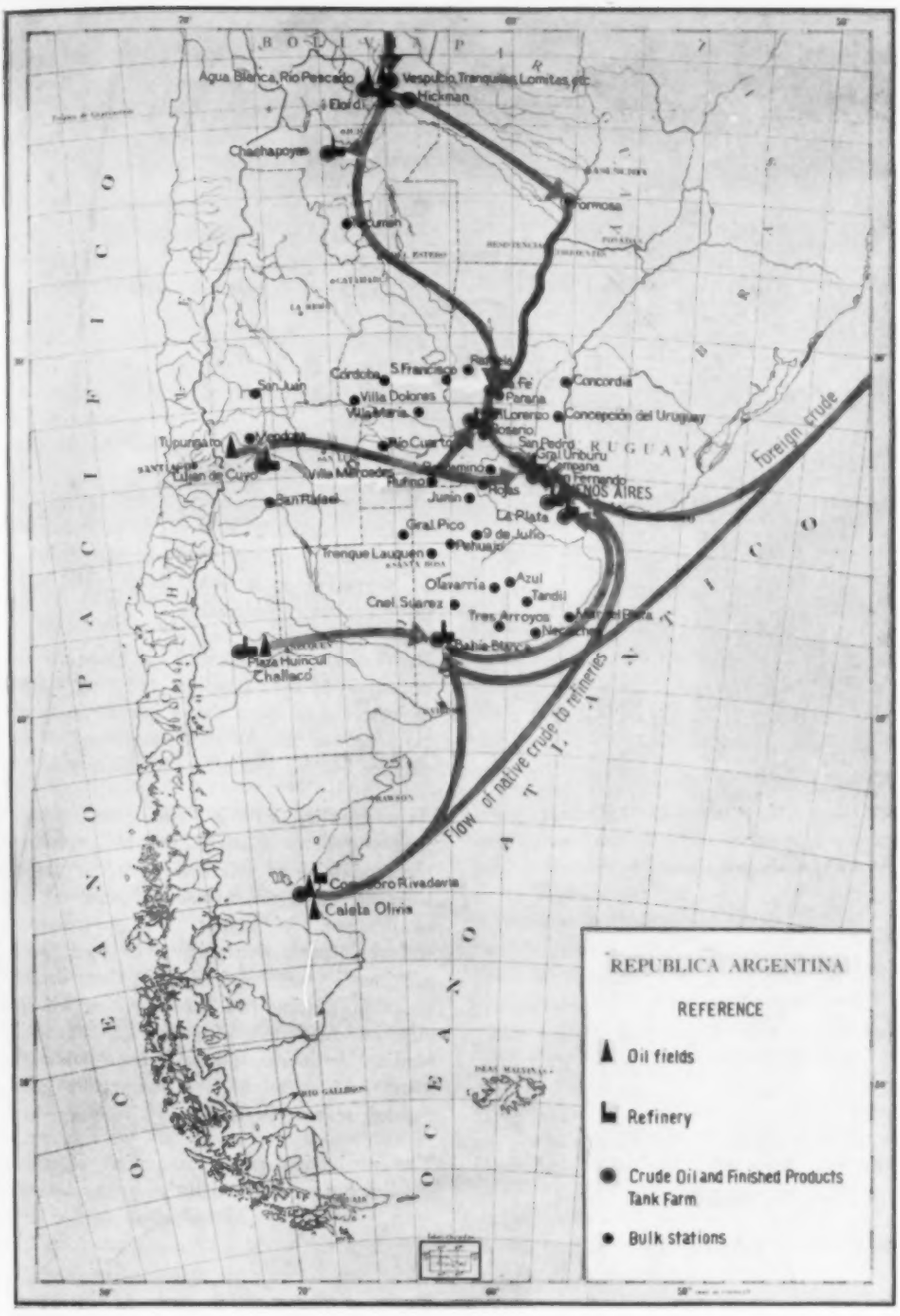
Naturally all these achievements were accomplished at the expense of equipment and parts, and 1945 found almost every refinery with its storehouses depleted and the plant in need of reconditioning.

The value of industrial and construction activities increased from 1,760 million Argentine pesos ($440 million) in 1944 with a similar value for 1945. Labor employed by industry increased from an index number of 100 in 1937 to 132.6 for the first ten months of 1945.

The amount of electrical energy consumed increased as follows:

Electrical Energy Consumed

Year	Millions KW/H per year	Year	Millions KW/H per year
1938	1,753.6	1942	2,135.8
1939	1,871.9	1943	2,257.2
1940	1,941.0	1944	2,415.1
1941	2,024.6	1945	1,549.6 (8 months)



Map showing flow of petroleum and products in Argentina.

Cargo transportation by private railroads increased from 8,954 million ton-kilometers per year in 1940 to 13,505 million ton-kilometers in 1944 (in 6 months of 1945 it reached 6,548 million ton-kilometers).

Argentina's population has experienced a gradual increase during the 10-year period 1935-1945, rising from 12,204,000 to 14,131,000. The volume of available goods, not counting construction and machinery, decreased from an index number of 100 in 1938 to 80 in 1945, demonstrating that native industry could not altogether replace imports.

There is no doubt that a number of enterprises classified as "war out-crops" will have to shut down, but as happened after the first world war a large proportion of recently developed national industries are here to stay and expand. The government through its different agencies, and especially the Banco de Credito Industrial, is actively engaged in developing industrial activities of prime importance to the country's welfare.

Despite the adverse influence of war, construction of roads has continued, although at a lower rate than before 1939. Buenos Aires is connected through a 685-mile concrete and asphalt road to Mendoza on the western border, through a 425-mile concrete road with Bahia Blanca, the principal harbor of the south through which thousands of tons of grain are shipped to Europe, and by an important road system to the progressive cities of Rosario, Parana, Cordoba, Santa Fe, Tucuman, Salta and Jujuy on the north. Tourists have good roads to the southern lakes, the Andean ranges and to the alluring sea beach of Mar del Plata with its magnificent Casino, one of the largest in the world. Brazil and Argentina are joined by roadways through the recently built bridge of Uruguayana and an ambitious program of future road building has been planned.

The competition between truck and railroad transportation which came to a dead point during the war period, will be renewed with greater vigor as soon as more trucks, tires and replacements become available. All these facts point to an expansion of motor-car transportation. Whether this will be by gasoline or diesel engines, there will be an important increase in the requirement of light fuels, the production of which will have to be balanced by a judicious use of cracking processes.

Some oil men contend that this balance will not be possible and that there may be an unsatisfied demand for diesel oil. If this be the case, Argentina will have to increase its imports of light crudes, turn to fuel oil some of its heavy crudes and convert its natural gas into gasoline and diesel oil by Fischer-Tropsch synthesis.

Taking into account the increase in population the improvement in living standards and the continuous industrial development of the country, it may be assumed that there will be a continued upward trend in motor car usage. The number of motor cars imported despite restrictive measures on exchange imposed in 1939, reached an average annual figure of 33,000 units in round numbers during the period 1934-1939 inclusive. Since practically no cars were imported from the second half of 1941 to date, it may be assumed that there is an immediate need of not less than 165,000 motor vehicles. If an average life of six to eight years for motor cars and trucks is assumed as the average for this country, there is an increase of 76.5 per cent of the average life for 1944, figured on 11 years. A replacement of 76.5 per cent of cars in use, or 356,000 units, may be expected in the near future.

Ingeniero Alurralde, until recently in charge of the division of Technical Economical Research of the general administration of public roads, and at present assistant director of development of the National Bureau of Transportation of the Secretary of Public Works, figures that by 1955 the number of motor cars on the roads in Argentina will reach between 800,000 and 1,000,000 units. His estimate is based on the assumption that these may be purchased at liberal terms as before 1939.

Taking the 820 gallons of gasoline consumed per motor car in 1940 as an average and allowing a maximum reduction of five percent in consump-

TABLE I

Production of Crude Oil and Products
(Barrels of 42 U.S. Gallons)

	1941	1942	1943	1944	1945	1946[1]
Production of crude oil:						
Comodoro Rivadavia	15,716,811	16,677,715	17,495,037	17,102,510	16,133,510	3,640,287
Neuquen (Plaza Huincul Challacó) (2)	1,071,237	1,677,480	2,278,609	2,367,688	2,346,208	515,283
Mendoza	3,344,217	3,203,321	3,017,357	3,115,689	3,116,060	752,209
Salta	1,881,207	2,145,645	2,044,508	1,643,747	1,284,223	253,789
Total	22,013,472	23,704,161	24,835,511	24,229,634	22,880,001	5,161,568
Crude run to stills:						
Native	22,446,117	23,347,235	24,768,554	23,634,386	23,131,632	5,257,874
Imported	3,810,758	2,388,942	871,064	976,686	980,598	1,358,942
Total	26,256,875	25,736,177	25,639,618	24,611,072	24,112,230	6,616,816
Finished Products:						
Liquid Gas	103,181	106,301	109,433	125,611	124,655	28,097
Aviation Gasoline	88,676	85,569	96,564	116,334	93,765	30,060
Motor Gasoline	8,399,301	8,150,878	7,544,176	6,968,314	6,529,089	1,966,984
Solvents	157,099	188,247	186,064	218,804	240,020	65,039
Kerosene	2,032,702	1,795,908	2,130,838	2,247,895	2,295,190	710,644
Gas Oil	672,055	593,078	481,279	388,433	370,248	111,383
Fuel Diesel (Distillate fuel oil)	2,420,958	2,308,833	1,838,636	1,674,184	1,515,733	456,786
Lubricants	461,321	543,865	554,092	626,660	592,700	131,178
Parafin Wax	145	1,296	2,151	1,019	6,378	1,132
Residual Fuel	10,098,243	10,166,407	10,727,645	10,298,378	10,275,482	2,418,889
Greases	31,815	27,506	24,147	29,343	31,236	7,391
Asphalt	408,793	391,785	381,476	404,592	410,724	108,829

Consumption of Major Products

Aviation Gasoline	78,669	84,802	85,179	103,867	109,408
Motor Gasoline	8,591,681	8,307,134	7,522,525	6,825,663	6,514,729
Kerosene	1,986,948	2,030,280	2,263,022	2,240,674	2,359,662
Gas Oil	964,156	639,297	485,141	410,794	373,418
Diesel Oil (Dist. fuel oil)	4,044,325	2,500,080	2,121,290	1,801,544	1,569,940
Lubricants	456,880	477,883	475,820	519,919	547,563
Fuel Oil Residual	16,828,329	14,592,051	12,213,255	12,118,113	12,418,555

(1) First quarter
(2) Challacó since 1942. Source: Statistical Department of Yacimientos Petroliferos Fiscales.

TABLE II

Imports of Crude & Major Products
(U.S. Barrels)

	1941	1942	1943	1944	1945
Crude Oil	4,118,304	2,397,991	1,116,873	1,126,280	1,190,986
Fuel Oil	8,742,047	5,099,028	1,972,490	1,974,011	2,663,636
Diesel Oil (Distillate fuel)	1,885,959	504,988	382,514	67,533	506,345
Gas Oil	318,536	113,365	.....	33	20,254
Lubricants	17,619	20,352	36,554	28,177	20,708
Kerosene	6	35,340	143,270	35,610	1,352
Gasoline and similar products	4,667	1,428	69	25	2,685

Source: Anuario del Comercio Exterior—Ministerio del Interior—Republica Argentina.

tion for improvement in gasoline quality, we arrive at 780 gallons per car. This reduction will be upset by an increase in motor car and truck transportation and touring because of improved roads and larger incomes, so the 1940 figure may be considered as a very conservative one.

Considering the figure of 800,000 cars for 1955 as possible, one may forecast a demand of over 525 million gallons for that year, an increase of nearly 50 per cent over the 1941 consumption.

These facts bring up two important points: (a) quality of gasoline; (b) amount of gasoline to be produced. As to quality, the government and the oil companies already have taken steps for its improvement. The prohibition on the use of ethyl fluid in motor gasoline has been lifted and oil companies will start marketing 70 octane gasoline, beginning 1917. It is understood that the possibility of manufacturing tetraethyl lead in Argentina on a rather large scale is being given serious consideration.

Refiners are busy considering plans for modernization of their gasoline producing units and at least one of them shows interest in catalytic cracking, not only for the improvement of motor gasoline but for 100 octane aviation fuel.

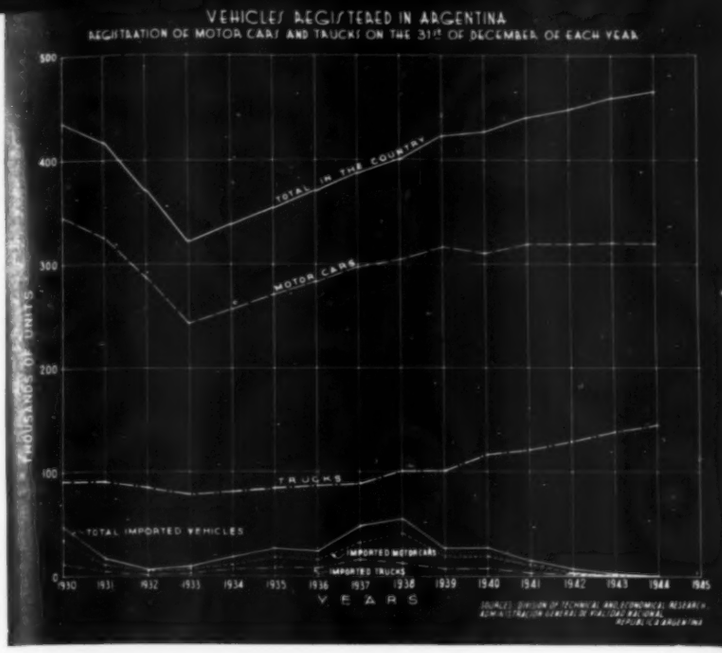
As to quantity, YPF is planning to build in the next year or so a new 22,000 bbl. refinery for the production of aviation and motor gasolines, kerosene, diesel oil, furnace oil, fuel oil and a small amount of asphalt. The government petroleum organization shipped in April last approximately two hundred 400-gallon drums of crude for testing and experimenting by North American designers who may be interested in bidding for the new plant. Private refiners have plans for increasing their marketable gasoline through refinery expansion.

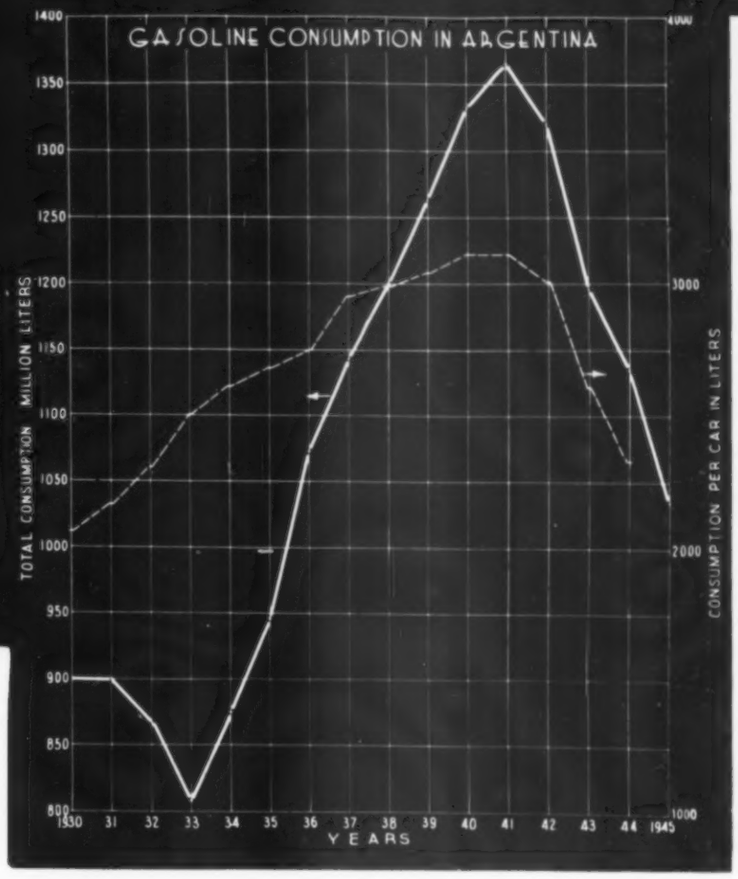
The production and consumption of aviation gasoline has experienced little change during the

TABLE IV
Argentine Refineries

Company	Location	Daily Crude Capacity in Bbls.	Daily Cracking Capacity in Bbls.		Distillation Processes
Y. P. F.	Puerto La Plata	33,300	Gas Oil	4,400	Complete
			Viscosity Breaking	5,000	
			Comb. Units	28,000	
Y. P. F.	San Lorenzo (Santa Fé)	10,100			Comb. Units and Polimeriz.
Y. P. F.	Luján de Cuyo (Mendoza)	3,800			Comb. Units
Y. P. F.	Chachapoyas (Salta)	1,900			Comb. Units
Y. P. F.	Plaza Huincul (Neuquén)	1,600			Topping
TOTAL	Y. P. F.	50,700			
Nativa de Petróleo	Campana (Bs. AS.)	16,000	Gas Oil and Viscosity Breaking	8,000	Complete
Nativa de Petróleo	Puerto Galván (2)	3,000	Gas Oil and Viscosity Breaking	1,850	Topping, Cracking and Ref.
TOTAL	NATIVA PETROL. CO.	19,000			
Standard Oil Co.	Manuel Elordi	1,000			Topping
Standard Oil Co.	Plaza Huincul	315			Topping
TOTAL	STANDARD OIL CO.	1,315			
Diadema Argentina	Dock Sud-Avellaneda (Buenos Aires) (1)	12,000	Gas Oil	8,000	Topping, Cracking and Ref.
Ferrocarrilera de Petroleo	C. Rivadavia (Chubut)	5,700	Gas Oil and Viscosity Breaking	2,000	Complete
Ultramar	Dock Sud-Avellaneda (Buenos Aires) (1)	4,400	Gas Oil and Viscosity Breaking	2,400	Complete
Cia. Petrolera Astra	C. Rivadavia	2,200			Topping
La Isaura	Loma Paraguaya (Bs. As.) (2)	2,200	Reduced Crude	1,000	Topping and Cracking
Lottero y Papini	Avellaneda (Bs. As.) (1)	630			Topping and Lub. Oil
Condor	Avellaneda (Bs. As.) (1)	750			Topping and Lub. Oil
Ragor	Quilmes (Bs. As.) (1)	130			Topping and Lub. Oil
General de Asfaltos	Wilde (Bs. As.) (1)	500			Topping and Lub. Oil

(1) Near the city of Buenos Aires.
(2) Near the city of Bahia Blanca.


VEHICLES REGISTERED IN ARGENTINA
REGISTRATION OF MOTOR CARS AND TRUCKS ON THE 31ST OF DECEMBER OF EACH YEAR
THOUSANDS OF UNITS
TOTAL IN THE COUNTRY
MOTOR CARS
TRUCKS
TOTAL IMPORTED VEHICLES
IMPORTED MOTORCARS
IMPORTED TRUCKS
1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945
YEARS



period 1939-1943, but 1944 consumption excelled the 1943 figure by 22 percent and 1945 was 29 percent larger. Air transportation in Argentina is being increased, practically at a continuous rate.

State lines have opened new routes to connect Buenos Aires with almost every important business and touring center of the country. An important expansion program of existing and new international air lines is being developed in accordance with the basic regulations agreed upon at the Chicago Aeronautical Convention.

The cornerstone of the Ezeiza Airport designed for 90 planes when finished, was laid in March 1946. Plans are being drafted for the construction of new airports within the next few years in the provinces of Cordoba, Buenos Aires, and in the territories of Chubut, Misiones and La Pampa. The information on hand does not give enough data for estimating future consumption of aviation fuel, yet an enormous increase is forseeable and some estimates forecast a demand for 50 million liters within the next five years. Plans are being drafted for the building of aviation gasoline, iso-octane and iso-pentane plants for the manufacture of 100 octane gasoline.

Kerosene production practically satisfied Argentina's requirements during the war period, although at times people had to form lines in front of kerosene pumps and some rationing had to be imposed by 1945. Much of this fuel is being used for ranges, stoves, roomheaters and for agricultural tractors. For the above reasons the Fuel Distribution Board sacrificed production of other fuels to assure the supply of kerosene.

The increase in population and its higher standard of living will bring a demand for kerosene for stoves and heating appliances much greater than before the war. As to kerosene for tractor fuel, no very large increase should be expected in the future; many of the new tractors are equipped with diesel engines and efforts are being made to favor the use of gas generators in the states with abundant forests. The abnormal increase observed during the war period is probably due to the use of kerosene in a number of engines running normally on other fuels, to the practice of private car owners of mixing some kerosene with gasoline for regular internal combustion engines (under the circumstances little attention was given to knocking and fuel consumption) and the use of kerosene heating appliances in apartment houses where central heating was reduced because of fuel rationing.

In surveying residual fuel oil consumption and in attempting to forecast future possibilities in Argentina, diesel oil utilization must be included; a very large volume of it is being used either alone or mixed with residual fuels for house heating and for small factories where comparatively light fuels are required.

During the war period, Argentine consumers depended largely on wood and grains to replace imported coal and fuel oil; this brought an important expansion in wood exploitation in the country, especially in the northern states. The government enacted on April last protective measures for the wood industry as well as for national coal production.

The new protective measures for the national coal and wood industries and the possibilities of developing hydraulic power in Argentina point to a probable replacement of fuel oil by other means for power and heat generation.

Whether the much talked-of 1,000-mile gas line from Comodoro Rivadavia to Buenos Aires, with its daily capacity of 35.3 million cubic feet will be built, now that the important improvements in the Fischer Tropsch synthesis for the conversion of natural gas into light liquid fuels has become known may be questionable. Comodoro Rivadavia oil fields, located on the Atlantic seaboard with good shipping facilities and with important gas production and large reserves, figured between 700 and 900 billion cubic feet, presents great possibilities for the Fischer Tropsch or Synthol processes. Argentina will depend in large measure for some years to come on foreign supply for its fuel requirements that will continue on an upward trend as heretofore.

With the exception of the demand for special oils for which local refiners managed to find substitutes, the war has not created many problems as to supply of lube oil requirements. The postwar period brings new problems with the improvement of lube oil quality required by new mechanical equipment and engines. Some importers have begun to advertise special lubricants manufactured in the United States and much discussion is going on about additives, some of which are already used by versatile oil marketers.

Steps taken for modernization of lubricating plants and expansion of existing facilities are indications that local refiners are giving special thought to these problems. One of the refiners is planning to erect a complete new lube oil manufacturing unit.

From personal interviews with local refinery management it is estimated that expenditures for modernization and expansion will be in the neighborhood of 100 million Argentine pesos ($25,000,000), and that replacements and stock rebuilding will demand an expenditure of nearly 12 million Argentine pesos ($3,000,000).

TRINIDAD OIL INDUSTRY, 1946

By M. V. YALE

THE picture is a challenging one. In the foreground, pointed up by recently released figures on Trinidad's wartime production, are the industry's present operations there. In the near distance are expansion and exploration, including marine drilling under what may be highly favorable conditions. In the background, and coloring the whole picture, is Trinidad's own particular set-up.

Between oil producing Trinidad and Venezuela whose mountains are in sight across the shallow Gulf of Paria, are marked differences and similarities. Different are Trinidad's stable colonial government, little problem with labor, British tradition and ownership. Similar are the island's geological formation and grade of oil. This varies from 16 API to 40 API, the island's average being 24.

Trinidad has the world's highest rock pressure gradients, the world's lowest royalty rates. There is no connection between the two save that they are both superlatives. Others that may be applied to the island are: Trinidad has the world's most famous asphalt lake, Trinidad has the world's longest jetty, Trinidad is the largest oil producer in the British Empire.

This last together with being located on the ferry route to Africa put Trinidad in a strategic wartime position for refuelling planes and bunkering ships. The island produced enough crude for this; the problem was to produce in record time high octane aviation gasoline in sufficient quantities.

Refining facilities of Trinidad Leaseholds Limited, at Pointe-a-Pierre, were expanded by the addition of a topping unit, a gasoline precise fractionation unit, a naphtha reforming unit, and an alkylation and butane isomerization unit. This expansion, a project of the British Air Ministry, was constructed in little more than a year. "Project 1234" as it was known was operated by Trinidad Leaseholds Ltd. during the war and has since been purchased by that company. Indigenous and imported crude oils and partially refined stocks from other Caribbean refineries were processed there for maximum production of aviation fuel.

At United British Oilfields of Trinidad at Point Fortin, Trinidad's other refinery, another topping unit was brought on stream in 1940 to handle the extra crude from increased wartime production in the field. It consists of a 2-coil McKee furnace reboiling the bottoms of two fractionating columns. This unit has a daily crude capacity of 18,000 barrels per day producing aviation base stock naphtha which during the war was pumped by pipeline to the refinery at Pointe-a-Pierre for reforming in connection with the government program for 100 octane gasoline. Also included in this figure are kerosene distillate, gas oil for diesel blending, and straight run fuel residue which was blended to meet fuel requirements of the U. S. Navy and the British Admiralty.

All the oil companies worked together as one to keep the crude flowing to the two refineries. By pooling their steel and drilling only their known reserves, a maximum oil production was accomplished for a minimum of steel. How successful this was may be seen from the following figures:

	Footage Drilled	Bbls. Crude Produced
1939	834,846	19,741,616
1940	1,025,622	22,226,874
1941	935,254	20,505,980
1942	623,398	22,069,178
1943	493,731	21,385,240
1944	456,957	21,634,965
1945	453,872	21,092,608

Present oil royalty rates which are the lowest in the world were not revised during the war, although the government was entitled to do so in 1939. Thus it has given the oil companies considerable financial assistance and is continuing to do so during the period of reconversion from drilling only in known reserves to exploring new areas. In 1934 when Trinidad's colonial government published regulations on the issue of all new leases, the minimum royalty was eight cents a barrel which at that time was approximately 10% of the crude value. The majority of royalty oil, however, is produced from older leases that have still lower rates.

Labor is no problem in Trinidad. The workmen are organized into trade unions, working from a minimum wage of 16½ cents (BWI currency, 85 cents on the U. S. dollar) an hour for unskilled labor in the fields to a maximum of over 40 cents for trained artisans. Throughout the war there was not one strike.

Exports of oil, according to the last report of the West Indian Royal Commission, amount to nearly 60% of Trinidad's total exports. Since 1930 exports of petroleum products have contributed more than half of the value of total domestic exports. The industry has played an important part in raising the general level of wages in the colony and a far more important part in increasing its over-all purchasing power abroad.

Twenty-three rigs are now running on the island. The wells, most of them relatively shallow, often must carry up to 140-lb. mud because of the unusually high rock pressure gradients.

While there is a large amount of minor faulting, chief one is the Los Bajos fault, running from Pt. Ligoure south of Point Fortin down in a southeasterly line across the island into the south coast north of Siparia Point. Main producing horizons in the Miocene are Moruga, Forest and Cruse sands; below the Miocene is the Oligocene containing the deeper Herrera sandstone.

Largest in the roster of oil companies is Trinidad Leaseholds Ltd. which also holds an interest in Northern Venezuelan Petroleum Co. and Siparia Trinidad Oilfields Ltd.; followed by United British Oilfields of Trinidad Ltd., Shell Group; Trinidad Petroleum Development Co. Ltd.; Apex (Trinidad) Oilfields Ltd.; National Mining Co.; Antilles Petroleum Co. (Trinidad)

World's longest jetty carrying pipeline and rails for movement of solid materials.

Ltd.; and Kern Trinidad Oilfields Ltd. Newest National Mining formed this spring from several small companies, chief ones being Trinidad Consolidated, Cory Bros. and Premier Oilfields. Marked co-operation exists between the companies. All their crude is processed for resale at TLL and UBOT refineries, other producers having small refineries for their own use but being under agreement not to market to the public. Retail outlets are Shell-Leaseholds Distributing Co. Ltd. (TLL and UBOT) and Standard Oil Co. of Trinidad, Ltd. (Standard of N. J.)

A different type of oil company is Trinidad Lake Asphalt Operating Co. which operates Trinidad's famous asphalt lake from whose hundred acres half a million tons of asphalt have been dug for paving and industrial uses all over the world. Oldest of the island oil companies, it is also the only one not British owned and operated, being controlled jointly by British and American interests.

In the spotlight today because of marine drilling is Trinidad Northern Areas, Ltd., an exploration company. TLL, UBOT, and the D'Arcy Exploration Co. are interested jointly in a large area in the north of the island held by Trinidad Northern. Certain marine concessions have recently been granted within territorial waters together with a marine concession containing around 95,000 acres beyond the 3-mile limit off the southwest coast.

Visible from the air are asphalt and oil seepages in the Gulf waters. Two of them, eight and ten miles southwest of Trinidad's Asphalt Lake are in a line with Venezuela's lesser known asphalt lake in the State of Monagas, closed to commercial operation fifteen years ago because of high operating costs. Another marine seepage is diagonally across the island northeast off the coast at Toco.

Interest is focused on the marine survey to fix international boundary lines in these waters which is now under way by a joint Trinidadian and Venezuelan Commission. Only change in recent years has been rights to Patos Island, the small rocky island nearest Venezuela's coast, ceded to Venezuela by Trinidad in 1942.

Licenses for marine drilling have been approved by the government for issue, and will be awarded the main companies this fall after the meeting of the new Council. Whether the Gulf of Paria will ever become another Lake Maracaibo remains to be seen. But the set-up is favorable; shallow protected waters free from strong tides and currents located between two rich areas. Add to this the technical developments in geophysical fields, including aerial geophysical mapping and improvements in underwater gravimeter techniques. Thus Trinidad's oil industry presents a picture that bears watching.

One of the 27 rigs currently running on Trinidad.

AFTERMATH OF WAR STILL HAMPERS ROMANIAN INDUSTRY

FOR the first six months of 1946 the production of crude oil in Romania was 2,124,000 metric tons (14,858,000 barrels). Based on this performance it is estimated that total output for the year will be of the order of 4,300,000 tons or somewhat less than the 4,670,000 tons obtained in 1945. The decline is due to the fact that owing to lack of equipment the extent of drilling and the production from new wells has not been sufficient to offset the decrease in yield from old wells in fields that have long been worked. In this connection it may be mentioned also that most of the drilling that has taken place has been in these older fields or in thin formations closely adjoining them and the yields per well have been lower than the average of wells brought in in former years.

The production per month, the extent of drilling and the disposition of the oil between the domestic and export market are shown in Table I accompanying.

Table I

Months	Output (1000 metric tons)	Drilling (metres)	Home Consumption (1000 metric tons)	Export (1000 metric tons)
Jan.	365	8,700	153	170
Feb.	326	7,700	138	188
Mar.	363	9,500	131	202
Apr.	355	12,772	125	204
May	360	12,775	126	218
June	355	14,000	125	210
Total	2,124	65,447	798	1,192

The results for 1945 and 1946 represent a substantial recovery from the year 1944 when the country was still (until August) subjected to Nazi occupation and its oil installations were the object of repeated attack, but they are still much below the average of pre-war years. The effect of the war is reflected in the following figures of output from 1938 to the present time.

Table II

Year	Production (1000 metric tons)	Exports (1000 metric tons)
1938	6,600	4,495
1939	6,240	4,172
1940	5,810	3,493
1941	5,453	4,072
1942	5,665	3,373
1943	5,273	3,159
1944	3,525	1,515
1945	4,670	3,100
1946 (est)	4,300	2,800

In the years immediately preceding the war roundly two-thirds of Romania's oil production was exported, mainly in the form of products. The bulk of these shipments went to countries of Western Europe. With the coming of the war and the extension of Nazi control over Romania all available exports were directed to Axis countries. The change in the export movement is indicated by Table III which shows in thousands of metric tons shipments for the six years 1938-43 inclusive by countries of destination.

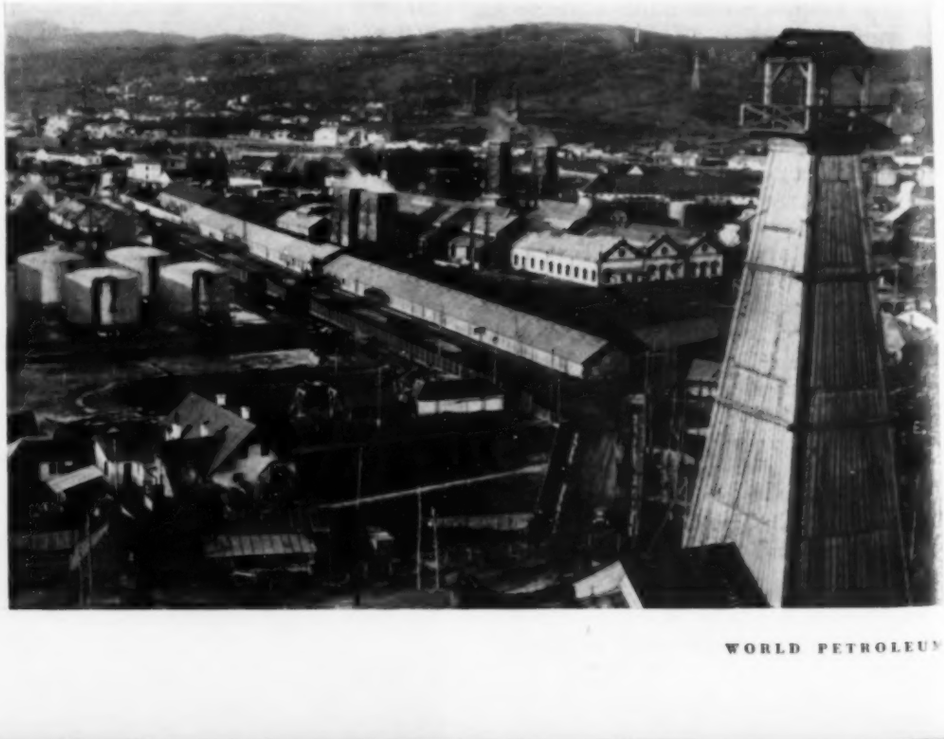
In order to facilitate the movement of oil to the Danubian Basin the Germans laid new pipe lines from Ploesti to Giurgiu and later built another line extending from Constanza on the Black Sea to the Danubian port of Cerna Voda. They also increased the shipments of crude, reducing the former preponderance of products, in order to supply refineries in Czechoslovakia and Germany. Shipments of crude which had been 300,000 tons in 1940 rose to 426,000 in 1942 and then dropped to 280,000 in 1944, the year in which the Nazis were expelled.

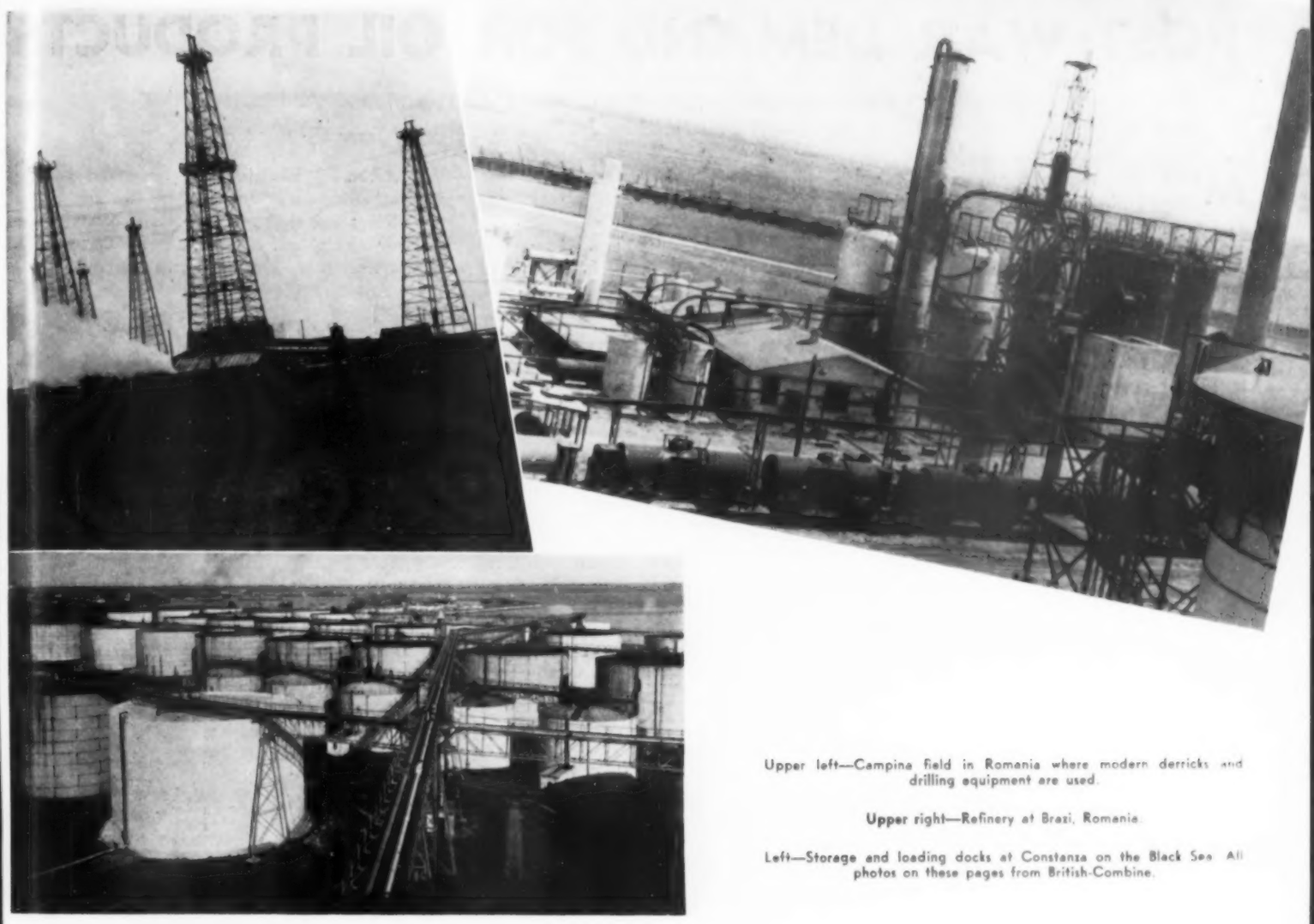
In August 1944 when Romania went over to the side of the United Nations and signed an armistice with the commanders of Soviet forces the country's oil trade underwent another drastic change. By the terms of the agreement Romania was required to pay heavy reparations and it was stipulated that half of the total should be in the form of oil, requiring approximately 1,750,000 tons annually. A later commercial agreement established a joint Russian-Romanian Company, Sovrompetrol, and provided that 75 percent of the royalty oil accruing to the Romanian govern-

Table III
Exports of Romanian Oil

Country	1938	1939	1940	1941	1942	1943
British Empire	642	655	575	—	—	—
France	386	391	243	19	82	15
Belgium	220	145	—	—	—	—
Egypt	283	86	55	—	—	—
Yugosalvia	143	150	147	20	2	1
Greece	200	75	188	11	31	26
Total	1847	1502	1235	50	115	42
Germany & Austria	704	1285	1430	2962	2215	2546
Italy	556	635	343	762	862	329
Total	1260	1920	1773	3724	3077	2875
Other Countries	1361	750	485	298	181	242
Grand total	4495	4172	3493	4072	3373	3159

Baicoi is one of the important Romanian oil towns.





Upper left—Campina field in Romania where modern derricks and drilling equipment are used.

Upper right—Refinery at Brazi, Romania.

Left—Storage and loading docks at Constanza on the Black Sea. All photos on these pages from British-Combine.

ment should be delivered to the company. The effect of this agreement is revealed by the following figures of export for the year 1945.

Table IV

Destination	Tons
Soviet Union (armistice agreements)	2,959,846
Soviet Union (commercial agreements)	181,948
Hungary	6,313
Bulgaria	2,580
England	293
Bunkers	7,020
Total	3,158,000

Announcement was recently made of the formation of a company jointly owned by Swiss and Soviet interests to market Romanian oil in Switzerland. Before the war Romania supplied about 135,000 tons of petroleum products to Switzerland. Most of this was produced by American and British companies. The annual consumption of Switzerland was about 550,000 tons. Since Switzerland has been largely untouched by the war it may be expected that its petroleum requirements will be substantially higher than in this earlier period. Possibly much more than the pre-war 25 percent will come from Romania but, in view of the Russo-Swiss agreement, not through pre-war channels.

To sustain the position of the Romanian oil industry it is necessary that a large number of new wells be drilled including the testing of new areas. Two factors are preventing progress with such an intensive program. One of these is the scarcity of equipment; the other is the disparity between costs and the price of products. The prices of crude oil and products fixed by the government are 40 times those of 1939. But the expenses incurred for labor in the oil fields and refineries are from 100 to 200 times the rates paid in that earlier year. These price changes are a reflection of the tremendous inflation that prevails in Romania. The degree of inflation is indicated by the revaluation of oil company shares which have been raised from 500 lei to from 10,000 to 20,000 lei in some instances. In other cases companies have met the situation by a proportionate increase in the number of their shares. On the exchange the quoted value of oil company shares have risen in similar degree. Astra Romana shares selling at 790 lei in 1940 were quoted at 155,000 lei on June 30 of this year. Steaua Romana had risen from 380 to 65,000 in the same period while Prahova had advanced from 220 to 9,200.

Renewal of commercial relations with the United States, Britain, France and Belgium is awaited with interest by oil companies in a position to obtain needed materials and equipment from former suppliers in those countries. In addition to drilling machinery already referred to many of the producing wells are in need of new pumping equipment. Inventories of machines and parts on hand at the beginning of the war have long since been exhausted and makeshift devices are being employed in the effort to keep wells and refineries in operation. Companies with Soviet connections such as Creditul Minier and Redeventa have been able to obtain a certain amount of drilling equipment and a number of trucks from Russia and Czechoslovakia but these countries cannot supply many kinds of machines and parts such as drilling outfits and pumping accessories for which the American type of equipment is preferred.

POST WAR DEMAND FOR OIL PRODUCTS

Estimated Market Requirements Based on Present and Anticipated Conditions — Rising Trend for All Products; Notable Gain in Distillates.

MOST remarkable and surprising development in the world oil situation in this the first year following the close of World War II is the fact that demand for petroleum products is exceeding the peak demand of the war period which was reached in mid-year 1945. Production world-wide is some 200,000 barrels daily higher than a year ago. Production in the United States is currently paralleling very closely the output a twelvemonth since. For the first six months of the year the average in the United States has been somewhat below the corresponding period of 1945 but there appears no present likelihood that coming months will witness a decline such as took place following V-J Day in August 1945 so that the total figure for the current year bids fair to equal if not to exceed the 1945 record.

This result is in contravention of the forecasts carefully prepared by petroleum economists, practically without exception. The general estimate was that with the disappearance of the major part of the military requirements which had carried output to a record high while the war was on consumption would revert to about the level of 1941 and that it would gradually increase to the proportions attained at the end of the war by the year 1950.

There were seemingly sound reasons for this conclusion. In the United States it was computed that the number of motor vehicles in use was from four to five million less than at the start of the war. Many of these were overage, indicating an abnormally high rate of scrappage for the next few seasons so that even with automotive manufacture proceeding at capacity it would require four to five years to bring the number of cars in operation up to the pre-war figure. Installation of oil burning equipment had been virtually suspended during the war years. In other countries where shortages of petroleum products were acute industrial prostration and financial stringency were expected to limit imports and distribution.

In actuality conditions in some respects have been less favorable to the early resumption of normal conditions in the petroleum trade than was anticipated when estimates were prepared last year. It could not be divined at that time that a series of nation-wide strikes in the United States would hold the output of motor vehicles during the first twelve months following the war to a fraction of the number estimated by the manufacturers themselves nor that other handicaps since applied would be imposed upon production. Similarly the restoration of settled conditions in some of the countries overrun by the war has advanced much more slowly than was anticipated. Nor is it true that the unexpectedly heavy demand for oil during recent months is due solely to the replenishment of depleted stocks. While there has been some building of crude stocks refineries both in the United States and elsewhere have been operating close to capacity and runs to stills for the world as a whole have been higher than last year. The explanation seems to be that the urge to obtain petroleum products is so strong that it is overcoming all obstacles. Instead of returning to the demand level of 1941 oil is continuing its pre-war trend of an increase in consumption of six to seven percent annually.

(Continued on page 63)

Tables 1 and 2 estimating current and future world demand for crude oil and refined products were prepared for World Petroleum by Howard W. Paige, Coordination and Economics Department, Standard Oil Company (N. J.).—Editor.

TABLE I

World Demand for Petroleum Products Refinery Runs and Crude Production (USA and USSR not Included)

(Thousands of Barrels Daily)

	1938	1941	1946	1950
TOTAL DEMAND—CRUDE & PRODUCTS				
Western Hemisphere (Ex. USA)	u	617	746	92
Europe & No. Africa	999	u	957	1,2
Other Eastern Hemisphere (Ex. USSR)	468	u	684	74
Total (Ex. USA & USSR)			2,387	2,94
CRUDE PRODUCTION				
Western Hemisphere (Ex. USA)	u	989	1,389	1,75
Europe & No. Africa	166	u	161	17
Other Eastern Hemisphere (Ex. USSR)	536	u	745	1,22
Total (Ex. USA & USSR)			2,295	3,15
REFINERY RUNS				
Western Hemisphere (Ex. USA)	u	890	1,158	1,43
Europe & No. Africa	137	u	270	47
Other Eastern Hemisphere (Ex. USSR)	748	u	683	93
Total (Ex. USA & USSR)			2,111	2,84
NATURAL GASOLINE, SYNTHETICS, ETC.				
Western Hemisphere (Ex. USA)	u	12	15	1
Europe & No. Africa	69	u	49	5
Other Eastern Hemisphere (Ex. USSR)	8	u	5	1
Total (Ex. USA & USSR)			69	6
TOTAL WORLD SUPPLY (Ex. USA & USSR)	u	u	2,364	3,22
TOTAL WORLD DEMAND	u	u	2,386	2,94
NET (SHORTAGE) SURPLUS			(22)	28

u—unavailable.

TABLE II

Breakdown of World Demand for Major Petroleum Products Outside USA and USSR

(Thousands of Barrels Daily)

	1938	1941	1946	1950
GASOLINE (Incl. Aviation)				
Western Hemisphere (Ex. USA)		158	176	23
Europe & No. Africa	394		322	43
Other Eastern Hemisphere (Ex. USSR)	124		151	18
Total (Ex. USA & USSR)			649	85
KEROSENE				
Western Hemisphere (Ex. USA)		22	28	3
Europe & No. Africa	74		59	7
Other Eastern Hemisphere (Ex. USSR)	61		51	7
Total (Ex. USA & USSR)			138	18
GAS OIL & DISTILLATE FUEL				
Western Hemisphere (Ex. USA)		74	88	11
Europe & No. Africa	192		219	27
Other Eastern Hemisphere (Ex. USSR)	91		121	14
Total (Ex. USA & USSR)			428	52
RESIDUAL FUEL OIL				
Western Hemisphere (Ex. USA)		288	362	43
Europe & No. Africa	234		285	31
Other Eastern Hemisphere (Ex. USSR)	129		287	24
Total (Ex. USA & USSR)			934	1,0

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Post War Demand

(Continued from page 60)

In this connection it is interesting to note that in spite of the unanticipated shortage in automobile production the net increase forecast in the number of motor vehicles in use in the United States which was estimated at roundly a half million for the first year following the end of the war is not far wide of the mark. While it was computed that upward of two million cars would be produced it was estimated that this would be largely offset by the scrappage of 1,600,000 to 1,700,000 old cars. Except for the intervention of the war the average number of cars abandoned each year would have been above two and a quarter million but owing to conditions that have prevailed the actual scrappage has been less than half this number so that the accumulated backlog of cars ready for retirement is theoretically some 6,000,000 to 7,000,000. As everyone now knows the owners of these cars due for the scrap heap, being unable to obtain replacements, have kept their old vehicles in use. As the average age of passenger cars on the road is now between eight and nine years with a large proportion of them much older the delay in new car production simply means that the backlog of scrappage is being built constantly higher and that the pressure to replace cars now in use with newer and more efficient models is growing more acute. It seems reasonable to expect, therefore, that even though motor car manufacturers raise their operations to peak level within the next several months it will be mid-year 1949 before the number of cars in operation reaches the 30,000,000 level of 1941.

Moreover the mileage being run by the cars now in operation is above all earlier estimates. Because of their age the consumption of gasoline per mile is higher than it would be if normal replacement had been possible and it is doubtful if the generally assumed average rate of 15 miles per gallon is now applicable. At any rate the demand for gasoline for all purposes during the first quarter of 1946 reached the remarkable figure of 1,800,000 barrels daily and has brought about a steady reduction in the stock of gasoline which had risen to 105,000,000 barrels in March last.

While the improvement in gasoline quality and in engine design are expected to bring about a gradual decrease in the consumption of fuel per mile of car travel there is nothing to indicate any change in the trend that has been in effect in the past toward a higher annual average mileage per car. Encouraging this tendency will be the huge expenditures projected by both the federal and state governments for road improvement including the building of a nation wide network of express highways linking up large centers of population. The net effect of these various influences may very well be an increase of 20 percent or more in fuel consumption by passenger cars by 1950. A comparable gain is to be expected in bus and motor truck usage.

TABLE III

Estimated U. S. Demand for Petroleum Products

(Thousands of Barrels Per Day)

	1946	1947	1948	1949	1950
Gasoline	1,853	2,022	2,125	2,121	2,074
Kerosene & Dist. Fuel	837	896	943	978	1,008
Residual Fuel	1,224	1,249	1,195	1,182	1,156
Lubricants	90	103	101	98	96
Misc., Crude as Such & Losses	571	625	602	599	587
Total	4,575	4,875	4,966	4,978	4,921

Stimulated by developments during the war and with a large backlog of accumulated demand an accelerated growth in the use of light and middle distillates appears certain to take place. From 1941 to 1945 the manufacturing capacity for diesel motors increased from five million to forty-five million horsepower.

In part, the rapid growth during this period was due to the extensive employment of diesels in naval craft and land vehicles for military use but civilian consumption of diesel fuel has doubled in this half decade. Its future employment will be encouraged by improvements in the engine itself, broadening its application to purposes ranging from small stationary power plants to giant railway locomotives. While the majority of diesel locomotives previously used by the railways were employed in switching service they are now being favored for heavy duty freight and passenger service and it was recently reported that one company had on its books orders for no less than a thousand such locomotives. In truck and bus operation the trend is definitely and strongly toward diesels because of their power efficiency and greater economy. In heavy industry diesel engines had attained a preferred position even before the war for powering tractors in farm operations, material handling and other similar tasks, a field in which exceptional activity is indicated for the immediate future. A doubling of the consumption of diesel fuel within the next few years appears not merely possible but highly probable.

Demand for oil heating installations has attained dimensions that will tax the facilities of manufacturers for several years to come. Authorities in this field assert that the number of domestic heating installations in the United States will increase by at least 2,000,000 or 80 percent by 1950 if the equipment can be supplied. With programs projected with government support for millions of new homes this appears a conservative estimate. Addition of this number of consumers would mean an increased demand for this grade of fuel oil of roundly 40,000,000 barrels annually. Aside from new construction a huge backlog of orders for conversion from coal to oil has accumulated during the period when it was impossible to make such changes.

While the ratio of motor oil to gasoline may decrease as in the past with improvements in the construction of cars and greater use of alloy metals that change is very gradual and will not affect the situation materially before 1950 since so many pre-war cars will be in use up to that time. The influence of non-petroleum lubricants now beginning to make their appearance on the market is problematical.

The same factors that are leading to an unexpectedly high consumption of petroleum products in the United States are at work in other parts of the world with the added stimulus arising from the necessity of replenishing stocks that were almost completely exhausted at the close of hostilities. Despite many handicaps industrial recovery in western Europe is making surprisingly rapid progress. In all parts of the world closer acquaintance with mechanized equipment has brought a keen appreciation of the value of oil powered machinery for agricultural operations, road and rail transport and a wide variety of other industrial uses. The world wide demand for improved transport facilities, greater food production, increased industrial output and a higher standard of living is the fundamental cause that will insure the continued rapid growth of oil consumption.

TABLE IV

Crude Oil Production

(Thousands of Bbls)

	1943	1944	1945
NORTH AMERICA			
United States	1,505,693	1,678,500	1,712,000
Canada	10,100	10,500	9,000
Mexico	33,795	36,000	42,500
Trinidad	22,000	24,000	21,500
	1,571,588	1,749,000	1,785,000
SOUTH AMERICA			
Argentina	24,400	24,200	22,680
Colombia	10,580	22,645	22,825
Peru	14,500	14,350	13,688
Venezuela	182,550	276,000	323,359
Others	3,000	3,500	3,650
	235,030	331,695	386,202
EUROPE			
U.S.S.R.	215,000	145,000	190,000
Romania	36,910	24,675	32,480
Other	16,235	27,000	26,500
	268,145	196,675	248,980
ASIA			
Bahrein	7,000	7,000	7,500
Iran	78,000	102,000	114,000
Iraq	25,350	29,000	32,500
Saudi Arabia	5,750	12,000	25,000
Other	24,800	36,000	12,500
	140,900	186,000	191,500
AFRICA			
Egypt	9,100	9,000	9,500
	2,224,763	2,472,360	2,671,182

PETROLEUM'S GREAT MODERN PROGRESS DUE TO SCIENCE AND INDUSTRY

By SIR WILLIAM FRASER,
Chairman, Anglo-Iranian Oil Co., Ltd.

Introductory Note:

In tribute to the late Lord Cadman, who at the time of his death was chairman of Anglo-Iranian Oil Co. Ltd. and for many years preceding had been a leading figure in both the technical and industrial progress of the oil industry, the Institute of Petroleum has established the Cadman Memorial Lecture. To deliver the first of these annual lectures the Institute appropriately selected Sir William Fraser, his long time associate and successor in the chair of Anglo-Iranian. The first part of the lecture dealt with the early career of Lord Cadman and his association with the oil industry up to the end of World War I in which he acted as petroleum advisor to the British government and as chairman of the Allied Petroleum Council. The latter part sketched the progress of the oil industry, and particularly its development in Iran with which Cadman was most closely associated, as indicative of the influence of science and industry working together, a partnership which Cadman exemplified in his own career and to the promotion of which his lifetime efforts were largely devoted. It is this portion of the lecture which is presented in the accompanying article.

EXPLORATION-drilling in Iran commenced in 1903 in an area where oil-seepages emerge from sandstone; it was hoped to strike large-scale production in similar sandstones at depth, but only small, short-lived production was obtained.

Drilling was next undertaken in the Masjid-i-Sulaiman area, where oil-seepages issue from thin, porous limestones in a strongly folded gypsum-salt series. Success was quickly achieved, the first wells encountering large-scale sustained flowing production. It was at first supposed that the rocks yielding the oil were lenticular limestones similar to the seepage-rocks, but it eventually came to be recognized that the reservoir-rock was the 1000 feet thick Asmari Limestone which underlies the gypseous series.

Subsequent drilling showed considerable disharmony between the surface gypsum-salt formation and the massive Asmari Limestone, the Asmari being folded in a simple, regular anticline much larger than any of the folds seen at the surface. The disharmony is such that large surface synclines are in some places underlain by major Asmari anticlines. The geologist had been handicapped in making deductions of underground structure, until the development of geophysical methods gave an essential diagnostic approach similar to that of X-rays in surgery.

Sir John Cadman

In the oilfields of S. Iran, Haft Kel and Gach Saran were discovered independently of seepages, while Agha Jari, Pazanum and White Oil Springs were discovered some years later, and in determining the position and trend of the hidden anticlinal structures in these fields seismic surveys have played a great part.

Up to 1921 drilling was generally undertaken by the percussion system. The rotary was in very limited use, as the type of bit could not cope with hard rock formations. After a time a combination system came into use, the rotary being employed for soft formations and the percussion for hard rocks. With improvement in special alloy steels for rock-bits the balance swung in favor of the rotary, and practically all drilling for oil is now so undertaken.

Until the 1920's oilfield control was largely in the hands of practical oil-men, the pioneers of the industry, to whom we owe so much, and whose art preceded the scientific approach which was rapidly developed during the years between the war. Geologists, who had alone largely held the scientific field in oil exploration and exploitation, were joined by geophysicists and physical chemists, and a true picture of underground reservoir conditions was brought to light, and consequently the most effective method of exploitation evolved.

Cadman was a strong believer in the principle of unit development, to which, very fortunately for all concerned, the oil-bearing areas in Iran lent themselves, and each oilfield there was, and still is, operated at a rate which ensures that no excess of gas is produced. Care is taken to keep the oil, water, and gas levels uniform throughout the limits of an individual field; in this way uneven encroachment of edge-water is prevented. By such control the lives of the oil-wells have been prolonged to a degree otherwise impossible.

It is of interest to note that the Masjid-i-Sulaiman oilfield, which commenced commercial production in 1911 and has produced to date some 100 million tons of crude oil by natural flow, is still so operating.

It is significant that Cadman was in the van of this movement, both administratively in Iran, and later in supporting the advocates of unit operation in the United States of America. In this latter connection he was, of course, able to cite what had been so successfully done in Iran where it has been possible to develop the oilfields

(Continued on page 66)

Sir William Fraser

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Petroleum's Great Progress

(Continued from page 64)

as natural units to the best advantage, and also to observe the effect of control on the pressures in the reservoir and on the movements of the gas-oil and oil-water contacts over great distances. These observations created a profound impression on production experts.

In the early days of the oil industry if a well started to produce water it was considered to be just bad luck. Nowadays, the policy is to determine the position of oil-water level, and to maintain control of this, watching any changes due to production by means of observation wells on the field perimeter. Not only does this reduce the water problems connected with the refining of "wet crude," but the natural rise of edge-water, the traditional enemy of the pioneer producer, is now used as an ally in connection with drainage of oil from its reservoir.

With the increasing depths of well completions, higher and higher reservoir pressures and temperatures—pressures of thousands of pounds per square inch against hundreds in the earlier days—have called for the scientific development of drilling operations and production practice.

Cadman played an important part in the discovery of oilfields in the United Kingdom, and as long ago as 1918 was associated with the late Lord Cowdray in the exploration undertaken at that time which resulted in a small discovery of oil at Hardstoft. Cadman's faith in the possibility of oil being proved in the U. K. at least inspired the passing of the Petroleum Bill, after which an active scientific investigation was carried out under the direction of Dr. Lees.

Intensive geological and geophysical surveys have been carried out, and are still continuing. Incidentally, the drilling operations have led to the discovery at great depths of hitherto unknown coalfields, of potash deposits, and of ironstone beds. Gravity, magnetic, and seismic methods have all contributed, and the network of observations from these surveys has now covered a large part of Central and Southern England.

With the advance in scientific ways of finding and producing oil, there has been an even more impressive advance on the chemical side, leading in turn to new ideas of the multiple products obtainable from crude petroleum.

True it is that within the walls of the Royal Institution, Faraday, 121 years ago, isolated benzene and discovered that the two gases, ethylene and butylene, which we know so well today were chemically related to benzene, but had very different physical properties. It might have been anticipated that great advances in our knowledge of petroleum chemistry would have followed within the next few decades, but in fact it was not until the early part of this century that the scientific study of petroleum began in earnest; even the presence of toluene and many other aromatic hydrocarbons in natural petroleum created no great interest at the time of their discovery; far less, as you may imagine, than the annual production of 250 million gallons of toluene from petroleum during the last war.

It is probably true to say that the first great awakening to the enormous complementary potentialities of petroleum and the internal-combustion engine took place in the first World War. The quantity of oil used in that war (about 30 million tons) was, of course, small by today's standards, but in those days it was looked upon as a large quantity, and it was then that we saw the first large-scale use of motor fuels for fighting vehicles and military transport, of aviation spirit and of fuel oil by the Navy.

It is of some interest at this point to consider for a few moments the elementary character of the petroleum products of those days, for they were very different from those now available. The old-type motor spirit was largely a straight-run distillate from crude oil, since, although the war considerably encouraged the cracking process, it was not operated on an important scale. Indeed, in 1914 motor spirit derived from cracking amounted to little more than one per-cent of the total output. The bulk was produced by distillation in shell-stills, and most refineries of the world were so equipped associated with auxiliary chemical refining plants.

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The rapid extension of the cracking process after 1920 was stimulated by three different considerations. In the first place, the demand for motor fuel was so great that simple distillation from the available crude oils could not meet it, and this, coupled with a large price differential between the gasoline, which was in short supply, and the heavier oils, which were not, directed attention to ways and means of converting the one into the other. A yet further incentive was given by the fear that natural reserves were being very gravely depleted. This was over twenty years ago, since when enormous quantities of petroleum have been, and still are being removed from the earth; so perhaps it is not surprising that, notwithstanding many great new discoveries, fears of petroleum shortage are still much alive today.

An additional impetus to cracking was given by the classical researches of Ricardo, which, started in 1919 and published in 1921 in the Institution of Petroleum Technologist's Report of the Empire Motor Fuels Committee, revealed for the first time that gasolines of different chemical compositions varied to a considerable degree in the extent to which they cause detonation or knocking in an engine, and that the knocking properties of a fuel determine its limiting engine performance. This revelation was of the greatest significance; moreover, it was demonstrated that cracked gasolines had better anti-knock qualities than straight-run gasolines, thus giving the cracking process a qualitative as well as a quantitative advantage. From these discoveries, followed by that of tetra-ethyl lead in America in 1922, evolved the modern motor fuels. Solution of the considerable problems involved in the refining of fuels produced by cracking, and removal of the health objections to the wide use of tetra-ethyl lead, greatly assisted this new advance, since it was now possible to produce good-quality motor fuels from a wide range of crude oils, including those which hitherto had not been considered suitable for making motor fuels owing to their straight-run fractions being of poor anti-knock value.

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(Continued on page 68)

How long since you thought of wrapping your product in STEEL?

Since steel containers went off to war, you've probably been using all sorts of substitutes But happier times are coming... Rheem steel drums are on their way back to you in quantity And after all, when it comes to containers, there just isn't any substitute for steel Because steel won't burn or char won't splinter or crack, won't melt or shatter or soak up moisture. And steel containers are easy to open, easy to fill, easy to close, easy to roll easy to stack and store.

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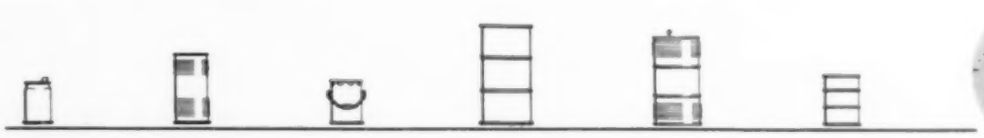

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Petroleum's Great Progress

(Continued from page 64)

as natural units to the best advantage, and also to observe the effect of control on the pressures in the reservoir and on the movements of the gas-oil and oil-water contacts over great distances. These observations created a profound impression on production experts.

In the early days of the oil industry if a well started to produce water it was considered to be just bad luck. Nowadays, the policy is to determine the position of oil-water level, and to maintain control of this, watching any changes due to production by means of observation wells on the field perimeter. Not only does this reduce the water problems connected with the refining of "wet crude," but the natural rise of edge-water, the traditional enemy of the pioneer producer, is now used as an ally in connection with drainage of oil from its reservoir.

With the increasing depths of well completions, higher and higher reservoir pressures and temperatures—pressures of thousands of pounds per square inch against hundreds in the earlier days—have called for the scientific development of drilling operations and production practice.

Cadman played an important part in the discovery of oilfields in the United Kingdom, and as long ago as 1918 was associated with the late Lord Cowdray in the exploration undertaken at that time which resulted in a small discovery of oil at Hardstoft. Cadman's faith in the possibility of oil being proved in the U. K. at least inspired the passing of the Petroleum Bill, after which an active scientific investigation was carried out under the direction of Dr. Lees.

Intensive geological and geophysical surveys have been carried out, and are still continuing. Incidentally, the drilling operations have led to the discovery at great depths of hitherto unknown coalfields, of potash deposits, and of ironstone beds. Gravity, magnetic, and seismic methods have all contributed, and the network of observations from these surveys has now covered a large part of Central and Southern England.

With the advance in scientific ways of finding and producing oil, there has been an even more impressive advance on the chemical side, leading in turn to new ideas of the multiple products obtainable from crude petroleum.

True it is that within the walls of the Royal Institution, Faraday, 121 years ago, isolated benzene and discovered that the two gases, ethylene and butylene, which we know so well today were chemically related to benzene, but had very different physical properties. It might have been anticipated that great advances in our knowledge of petroleum chemistry would have followed within the next few decades, but in fact it was not until the early part of this century that the scientific study of petroleum began in earnest; even the presence of toluene and many other aromatic hydrocarbons in natural petroleum created no great interest at the time of their discovery; far less, as you may imagine, than the annual production of 250 million gallons of toluene from petroleum during the last war.

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(Continued on page 68)

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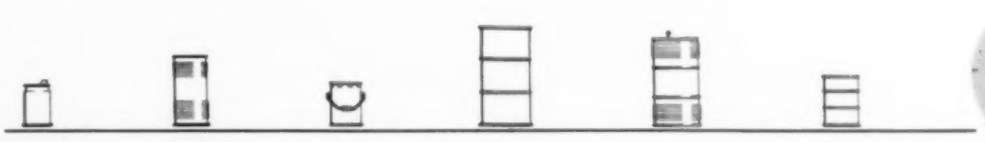

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INT IN BINDING

Petroleum's Modern Progress

(Continued from page 66)

attention was being attracted to the utilization of the gases produced in very large volumes by cracking operations. The research chemists had for some time been engaged in finding commercial applications for natural gases, but, although they evolved several processes by which these gases could be converted into high-octane gasoline components, few were economic, and, except in certain isolated cases, were not developed. With the advent, however, of the more reactive olefins contained in gases from cracking processes, attention turned to these much more promising materials, from which developed synthetic processes which were later destined to play a valuable, if not essential, part in the second war period.

Thus it was that the synthetic hydrocarbon products, of vital importance in the manufacture of aviation spirit, came to the fore. The first of these to be made commercially was iso-octane, which previously had been available only in very small quantities for use in research and engine-testing laboratories. Iso-Octane was made from the butane fraction of cracked gases by successive steps of polymerization in sulphuric acid and hydrogenation; its coming greatly aided the development of high-performance aero engines which have recently served us so well. However, research still proceeded on its inevitable course, and barely two or three years later, the large-scale manufacture of iso-octane was superseded by hydrocodimer, a similar material obtainable in almost double the yield from the same butane fraction; in addition, it gave rather better aero-engine performance. Polymerization and hydrogenation again played their part, but the former was carried out under more severe conditions in order to make a greater portion of the butane feed-stock react.

1937, however, saw a yet greater advance through the discovery of the alkylation process, where I am proud to feel British research workers did some really fine work. It now became possible, in one stage, to produce a much greater yield of high-grade aviation fuel component direct from the butane fraction of cracked gases by the action of concentrated sulphuric acid. How great was the contribution made by this process to the supply problems of the war is evidenced by the fact that, on an average, all Allied aviation fuels contained 20 to 30 percent of this material, the quality being largely determined by the alkylate content.

The years immediately preceding 1939 also saw important new developments in the application of catalytic methods of oil refining and oil conversion, among which the catalytic cracking process is outstanding. Petroleum chemists have, for many years, been keenly interested in the application of catalysts in petroleum refinery technology. Bauxite and clays have been used since the earliest days of refining, and it is of more than passing interest to note that this same general class of inorganic material is used in catalytic cracking processes. The urge to use catalysts in the cracking of heavier oils to make gasoline arose out of a growing dissatisfaction with the inability of the conventional cracking methods to produce products having octane numbers of much above 74 to 75, and because the technicians thought that the use of catalysts would enable them to control the cracking process more effectively, and so obtain products better suited to particular requirements.

So successful were their efforts that the installed catalytic cracking capacity is now as great as that employing the older non-catalytic process. Of considerable war importance was the additional fact that the gasolines refined after catalytic cracking could, with much advantage, be incorporated in aviation fuels, whereas this was never considered feasible with thermally cracked gasolines. Another wartime advantage of catalytic cracking was the large amount of cracked gases produced as a by-product which served as excellent raw materials for alkylate manufacture, and catalytic cracking plants with alkylation units attached were of the greatest value in producing enormous quantities of aviation fuels when most wanted. Perhaps of as great importance to the Allies was the production in the U.S.A. of synthetic rubber from the butadiene simultaneously produced in the process. Thus, of the processes installed in American refineries during the war, catalytic cracking was probably the most significant, since it provided the basic materials for both aviation fuel and synthetic rubber manufacture.

Other oil-conversion processes were also developed in the years 1935 to 1939. These included a catalytic process for naphtha reforming, a process in which straight-run fractions of low octane number, such as those normally processed in thermal reforming units, are subjected to the action of catalyst to form high-octane materials of high aromatic content. This process was destined to play an almost vital part in the manufacture of toluene for explosives, and, being applicable to a very wide range of crude oils, was, of course, a great improvement over earlier methods. In the first World War toluene was extracted from light distillates obtained from a few special types of crude; in the second it was produced by the catalytic conversion of naphthas containing methylcyclohexane, a much more widely distributed source of supply.

Another process which, developed in the research laboratory in the period 1936 to 1939, was destined to make a large contribution to aviation-fuel manufacture is butane isomerization, a process by which isobutane, essential to the alkylation process, could be produced by changing the chemical configuration of normal butane. This was also a catalytic process.

As distinct from most of the processes above mentioned, which were so largely concerned with highly scientific attacks on the intimate molecular structure of petroleum, the distillation process for the separation of petroleum oils into their primary components has been made highly effective during recent years, and the size of the distillation units installed in the refineries has correspondingly increased. Distillation was originally effected in simple stills equipped with rudimentary fractionating columns, and the degree of separation achieved between the various fractions was in most cases very poor. The change was mainly brought about by the large-scale adoption of the pipe-still and bubble tower for continuous distillation, and this equipment gradually attained a high standard of reliability and efficiency. For economy of operation these continuous units were built in very large sizes, some are capable of processing up to three million gallons per day of crude!

These developments on the commercial scale had a pronounced effect in stimulating research on distillation methods, which had hitherto appeared to offer little scope for improvement. It soon became practicable to separate crude oil not only into more sharply defined fractions of its major constituents, but even into fractions of very narrow boiling range, consisting of pure or nearly pure hydrocarbons; thus was made possible the isolation of some of the individual components of petroleum, the individual bricks of the petroleum structure. During the late war enormous quantities of these hydrocarbons were prepared by superfractionating processes.

And so we come to lubricating oils which were once distilled direct from petroleum, the wax being separated by chilling and filtration. The oil itself was then refined by sulphuric acid and soda or by the use of clays. Today, however, the processes are much more complex, and the products of much better quality and adaptability. The basic distillation process has been radically improved, and a new process introduced through which materials in the raw stock which have a bad effect on engine behaviour or oil stability are removed by solution in selective solvents. Wax removal has also been assisted by the use of solvent dewaxing methods. A further major development is the use of additives. Compounds have been developed which are capable of improving the lubricity of a lubricating oil, of improving its resistance to oxidation, of improving the low-temperature behaviour, of improving its behaviour in an engine, and of bettering its properties in several other directions. So it has now become possible to manufacture high-quality lubricants from a much wider range of petroleums than was formerly thought feasible, and hence the range of potential production has been much extended. The lubricants now made from petroleum range from aero-engine oils to sewing machine oils, from high-duty motor oils to watch and instrument oils, and from cutting lubricants to brake oils and rust-preventing oil

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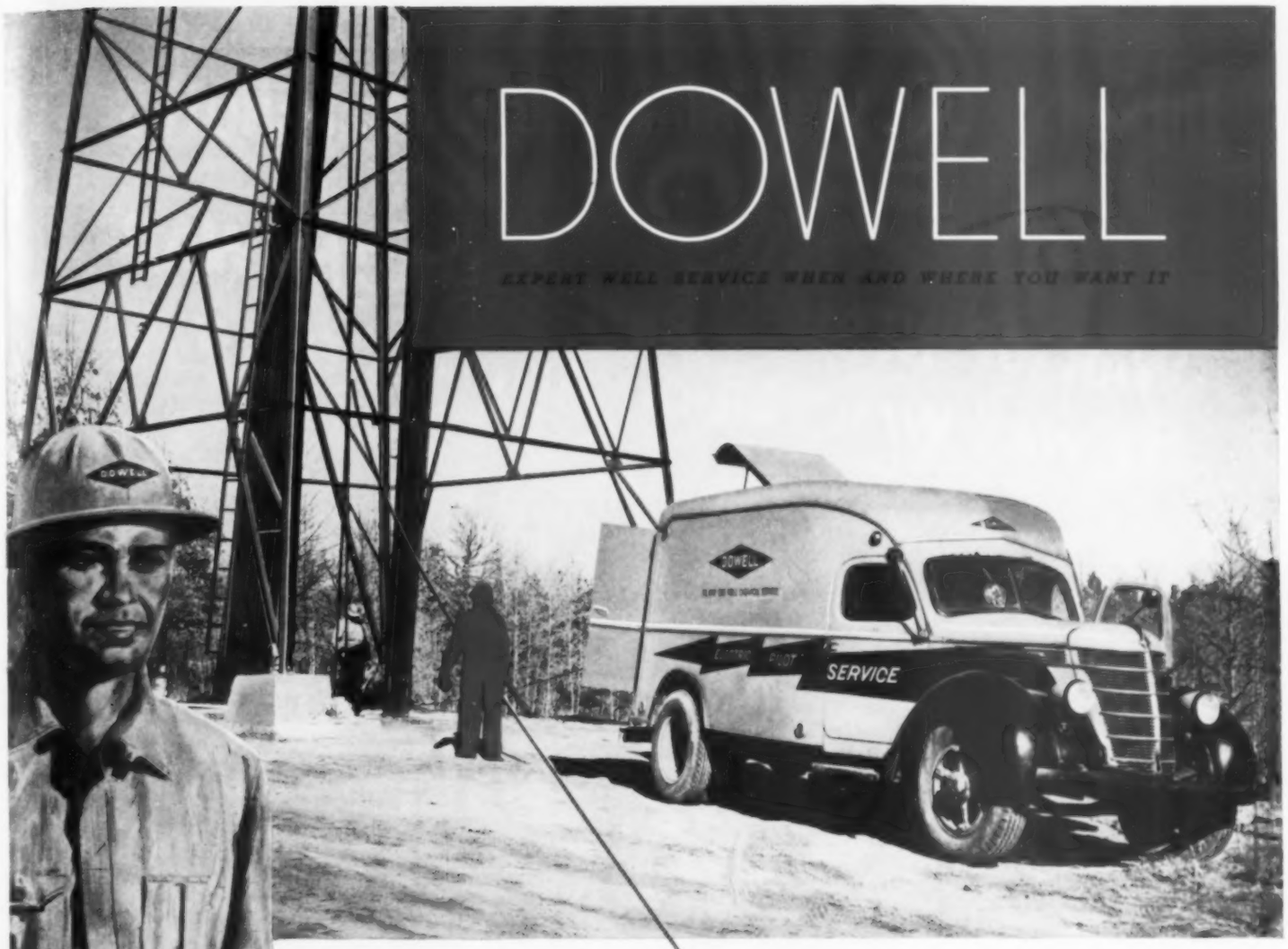

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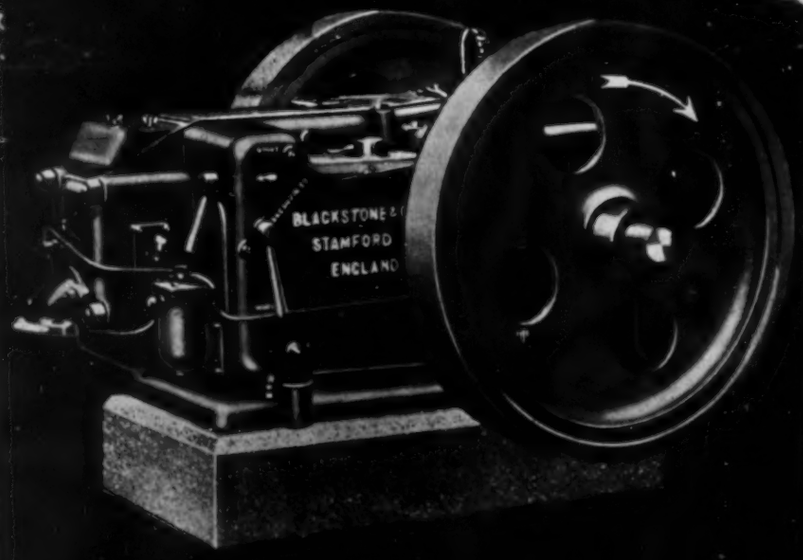
IT WAS WAR FOR OIL AND OIL FOR WAR



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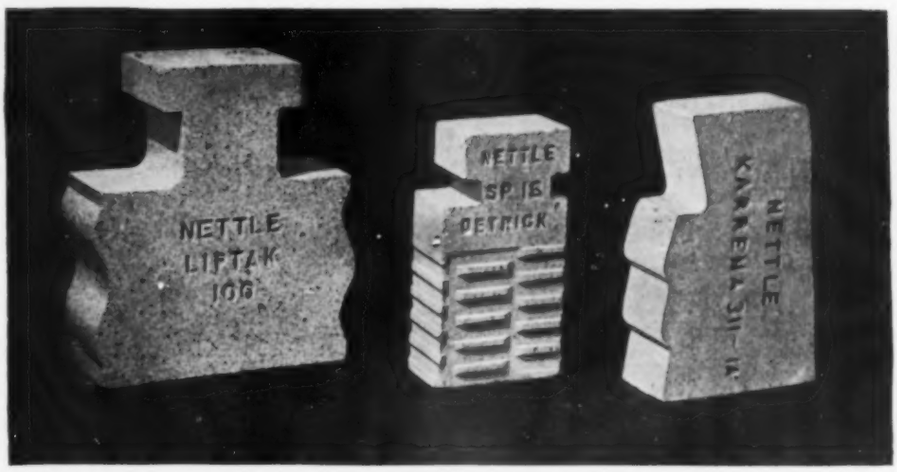

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CAPITAL SIDELIGHTS ON OIL

By WILLIAM J. MADDOX

Chief of World Petroleum's Washington Bureau

WASHINGTON.—It will have to be an outstandingly favorable proposition to the Government to induce the War Assets Administration to dispose of the Big and Little Big Inch Pipe Lines for any other use than the transportation of oil. In fact, David McPherson, assistant deputy administrator, said in opening the bids for the two lines on July 31 that "it may be advisable to request further authorization from Congress before considering non-oil use."

Leo. F. Connell

Practically all the bids involved the use of the lines for natural gas, at least as an alternate proposal and at the discretion of the buyer. The bids are now being analyzed, the oil proposals first, oil-gas combinations or alternates second, all-gas offers third, and others fourth. WAA officials say they will be reviewed in "direct conformity" with the policy authorized by Congress when it approved the report of the Surplus Property Administration on disposition of the big pipes.

Among the interesting sidelights of the bid-opening was the appearance of former trustbuster Thurman Arnold and former Undersecretary of Interior Fortas names as counsel for a bidder who would transport crude and products to the East Coast "on a mutual co-operative basis at actual cost." Priority would be given independents to relieve them of "restrictions that might otherwise be imposed" by large oil companies. Name of the company to be organized, if the bid were acceptable, would be the Mutual Oil-Gas Transmission Company. Although the original intention is to use the lines for oil, the company might reconvert one or both to natural gas.

In weighing the bids, WAA is expected to follow the disposal policy for Government-owned pipe lines proposed by Surplus Property Administration in its report to Congress early this year. Gist of the recommendations were that "first preference will be given to continuing the Big and Little Big Inch in petroleum service." Highlights of the plan were:

1. If the Big Inch and Little Big Inch cannot be disposed of for the movement of crude oil and petroleum products from the Southwest to the East seaboard, they should be disposed of for service to interior points.

2. Disposal to private interests will be given preference.

3. All segments of the petroleum industry, particularly small independent operators, will be given the opportunity of acquiring the lines.

4. Should it prove impossible to sell the lines to the petroleum industry, consideration will be given to the possibilities of lease.

5. Public operation on a full cost basis may have to be considered if all efforts to dispose of the lines to private industry should fail.

6. Disposal for conversion to natural gas will be favored only if it proves impossible to keep the lines in petroleum service and the national security is otherwise adequately protected.

All the various government agencies that at one time or another have had a finger in the disposal of the Big and Little Big have shied away from the possibility of conversion to natural gas. One answer to this has been opposition by the railroads, the eastern coal operators and the United Mine Workers. One thought on this from the standpoint of the petroleum industry is that some industrial plants and many householders on the East Coast might convert from oil to gas, if rates became favorable.

Under the new Price Control Act, hastily rammed through in the last days of the 79th Congress, petroleum and products seem to be definitely out from under OPA control. Machinery is provided for slapping on price ceilings again, but the possibility appears very remote in view of the conditions that the law says must obtain to make this necessary. There are three conditions, and each one is tied to the others with an "and." At any time after August 20, the Decontrol Board set up in the act, can direct that certain commodities — including petroleum and products—shall be regulated, if it finds "that the price of such commodity has risen unreasonably" since June 30, 1946; AND that it is "in short supply"; AND that the public interest will be served by such regulation.

Carroll D. Fentress

As for the stripper well subsidy—the act puts an end to this "not later than April 1, 1947." It must be progressively reduced so as to terminate without a jar on the industry. At the present moment it looks as if the present rates would be continued to the end of September. Payments for the final quarter probably will be cut one-third. Another third will likely come off for the first quarter of 1947, with all payments ending April 1.

John A. Loftus, head of the State Department's Petroleum Division, sees a "growing pressure for negotiation of some kind of world oil agreement" but "only time will tell the full scope and efficiency of such international undertaking as may ultimately emerge." However, the State Department has some ideas as to the form that such an organization might take, and Loftus revealed these recently in talking to a group of Army men who are attending a petroleum engineering course at the University of Pittsburgh sponsored by the Army-Navy Petroleum Board.

"An instrumentality of the United Nations, consisting of expert representatives of many nations," Loftus told the class, "would give continuing consideration to the political and economic problems of the international oil trade, would study the terms and conditions under which oil is developed in various parts of the world, whether under concession contracts or under general laws, and would be able and ready to advise governments and oil companies about the patterns of arrangements most likely to prove mutually beneficial and conducive to stability of commercial operations.

"Such a body might additionally have authority to review the terms of concession contracts and to recommend revisions thereto. Nations which had already concessioned out part or all of their petroleum resources to private foreign companies might be free to appeal to such international body for a review of either the terms of the concession arrangements or the concessionaire's compliance.

"Nations believing themselves to have inadequate access or at unreasonable prices to the oil supplies of the world would be free to appeal to the international body for a review of the circumstances of the case, and the international body might be authorized to recommend to governments and companies corrective measures if such were needed.

"Through the fact-finding facilities of the international body such basic facts of the international oil trade as costs, prices, royalties, inter-company contracts, and similar data would be of public record available internationally."

It appears doubtful that an attempt will be made in the next Congress, which meets in January, to revive the tidelands bill, which President Truman turned thumbs down on when rushed to him in the closing days of the last Congress. If the President's veto-message prediction that the Supreme Court will hear and probably decide the pending case during the next term of the court, there may be no need of Congressional action to quit-claim Federal title to the offshore lands.

However, there is some skepticism among observers that the Court will be ready by next term to hear and decide the case. But the President gave as his authority for the forecast Attorney General Tom Clark. To quote the veto message: "I have been advised by the attorney general that the case will be heard in the Supreme Court and will probably be decided during the next term of the court." In this reporter's experience, it's slightly unusual for an attorney general — or any other government official — to hazard a guess on what the court will do.

Robert E. Friedman

As a basis for his veto, the President said: "The attorney general advises me that the issue now before the Supreme Court has not been heretofore determined. It thus presents a legal question of great importance to the Nation, and one which should be decided by a court. The Congress is not an appropriate forum to determine the legal issue now before the court. The jurisdiction of the Supreme Court should not be interfered with while it is arriving at its decision in the pending case."

(Continued on page 126)

UNDIVIDED RESPONSIBILITY IN ONE ORGANIZATION

M·E·K SOLVENT DEWAXING PLANT

This 2000-barrel M. E. K. Solvent Dewaxing Plant (process licensed by Texaco Development Corporation) was recently completed by Arthur G. McKee & Company for The Pennzoil Company at Oil City, Pa. Design, engineering and construction were handled entirely within our own organization.

Arthur G. McKee & Company

★ Engineers and Contractors ★

2300 CHESTER AVENUE · CLEVELAND, OHIO

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NEW YORK, N. Y.

McCORMICK BUILDING
CHICAGO, ILLINOIS

UOP's NEW PHYSICS LABORATORY

THE Universal Oil Products Company has recently dedicated one of its new buildings designed especially for the investigation of the problems of physical chemistry of petroleum refining. The need of such a laboratory has arisen from the fact that physical methods in the analysis and testing of oils have become almost of as much importance as chemical methods especially in research on the physics of hydrocarbon molecules.

The equipment housed in the new $250,000 building includes ultra-violet, visible, infrared and Raman spectroscopic apparatus, a mass spectrometer, X-ray and electron diffraction units, an electron microscope, microphotometers, surface area measuring equipment and a wide variety of physical and electrical apparatus for determining various properties of oils and catalysts, such as di-electric constants, porosities, freezing points and others.

In an announcement issued by U.O.P. to celebrate the occasion Dr. Glenn Webb, Director of Universal's Physics Research Division, summarizes the kind of information that may be obtained with the help of these instruments, with special reference to information having a bearing on petroleum refining.

When ultraviolet light from the ultraviolet spectrophotometer is passed through a sample of a chemical compound, certain wave lengths of light are absorbed more than others. This absorption spectrum, which may be obtained with an ultraviolet spectrophotometer, is different for each compound. This fact is used in controlling the operation of hydroforming units and plants making raw materials for synthetic rubber manufacture.

Recording microphotometer in new UOP physics laboratories.

Since no two hydrocarbons exhibit the same absorption pattern and the pattern obtained for a mixture is simply the sum of those of the components it has been possible with the infrared spectrometer to obtain reliable quantitative and qualitative analyses that were extremely difficult or time consuming by other methods. Among these, to mention only two, are the studies of the products of alkylation and isomerization plants.

The Raman effect, though obtained from the Raman spectroscope in an entirely different manner than the infrared absorption spectrum, is considered to be a complement to infrared absorption work. As in infrared absorption, each compound exhibits its spectrum, which is different from that of every other compound. The Raman effect is mainly useful in qualitative identification and semi-quantitative analyses of organic compounds in unknown mixtures. It can be employed with aqueous solutions as well as with anhydrous mixtures.

When a molecular compound is bombarded with electrons in the mass spectrometer, the molecules are "cracked," and a large number of positively charged fragments is produced. The relative abundancies of the various fragments are, for a given set of operating conditions, unique for each compound. It is this property which is utilized in mass spectrometric work. The mass spectrometer provides a new tool for the quantitative analysis of complex mixtures of light hydrocarbon gases encountered in many petroleum refining operations. It is indispensable in determining the presence and identity of trace impurities in gases, such as butadiene, helium and oxygen, to mention a few. It can also be used in identifying the isotopes of various elements, such as those of carbon having masses of 12 and 13. This makes it possible to study mechanism of reactions by incorporating a small amount of a tracer isotope in the reaction mixture, and following the entire reaction by analyzing the reaction products for the tracer isotope by means of the mass spectrometer.

Infrared absorption spectrometer.

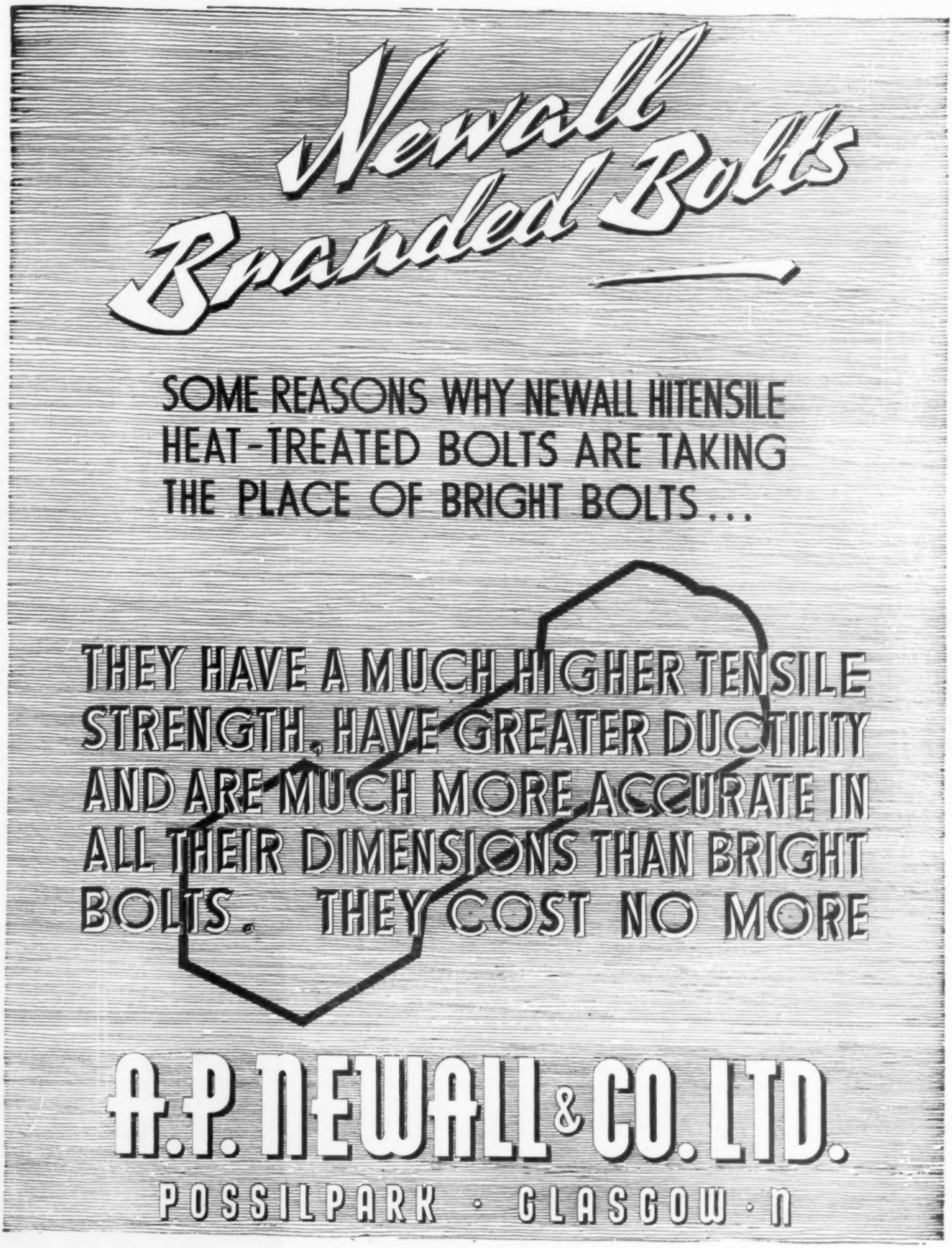
The large Bausch and Lomb Littrom spectrograph rounds out the spectrographic facilities at U.O.P. This unit is primarily designed for the study of emission spectra in the ultraviolet, visible, and photographic infrared regions. Complete descriptions of this type of instrument and its uses have been published in several books, notable among them is Brode's "Chemical Spectroscopy."

X-Ray diffraction with the X-ray unit offers a method of studying the arrangement of the atoms in all kinds of matter. By this method it is possible to distinguish between various crystalline forms of the same material, and between different states of hydration. X-ray diffraction also presents a method of measuring the average crystal size of powdered materials. A wide range of catalytic materials have been studied

Electrical computer for quick solution of intricate mathematical problems.

That remarkable invention, the electron microscope, as applied in the field of catalysis, has furnished a method of studying the particle size and shape of catalyst supports. Examination of catalyst promoters prepared by different methods has led to improved catalyst performance by indicating preferred methods of preparation of catalysts.

The new U.O.P. physics building also includes a general laboratory in which physico-chemical studies on catalysts, oils, etc., are carried out. The equipment installed in this laboratory includes an Andrews' apparatus for studying the P-V-T relations of hydrocarbons and their critical properties, a surface area unit which is used for determining the surface properties and pore size distributions of catalysts, optical microscopes, equipment used in preparing catalysts on a small scale, and a group of muffle furnaces for calcining catalysts at temperatures up to 2500°F. in various atmospheres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Oil Company Staff Changes

G. E. Bubar

Albert E. Ernst

G. E. BUBAR, manager of wholesale distribution of the Standard Oil Company of New Jersey, has announced his retirement from active company affairs. Mr. Bubar began his career as a clerk with the Waters-Pierce Oil Company in Mexico, in 1907. In 1914, he went to the West India Oil Company as an assistant special agent. Posts in the company's sales department at Costa Rica and Panama followed. In January, 1917, he became assistant business manager for the International Petroleum Company in Peru, later becoming business manager.

Following his foreign service, Mr. Bubar returned to the United States in February 1930 as assistant sales manager in charge of operations for the Colonial Beacon Oil Company in Boston. In 1934, he came to the Standard Oil Company of New Jersey. In 1936, he was made manager of wholesale distribution and he was elected a director of the Standard Oil Company of Pennsylvania in 1941.

RAY E. MILLER has resigned as a director and vice president in charge of Gulf Coast sales for Warren Petroleum Corporation to become sales director of the petroleum chemicals division of the organic chemicals department of E. I. DuPont de Nemours Company, with headquarters in Wilmington, Delaware. As sales director of that newly created division he will organize and direct a new sales organization to be set up to handle sales and distribution to the oil refining industry of that company's petroleum additives.

Mr. Miller became affiliated with the natural gasoline industry in 1928 when he became secretary-treasurer of the Natural Gasoline Association of America. After serving in the Air Corps in World War I, he managed the personnel and safety department of the Marland Oil Company, then became safety director with the Mid-Continent Oil & Gas Association. He left the Natural Gasoline Association in 1934 to join Hanlon-Buchanan, Inc., as vice president in charge of sales.

W. M. ROBERTS has been appointed manager of Standard of California's recently created labor relations department. "Bob" Roberts joined Standard in 1919 following service with the ambulance corps in France in World War I. He has been engaged in employee relations work for Standard for the past twelve years.

ALBERT E. ERNST, wartime chief of the Petroleum Division of Lend Lease and of the Foreign Economic Administration, has rejoined the California Texas Oil Company as Special Assistant to H. M. Herron, chairman of the board of directors.

Before the war Ernst had a broad range of experience in the foreign subsidiaries of The Texas Company and of Caltex, in sales and management capacities in the Far East, South America, Africa and Europe, extending over a period of about fifteen years. Shortly before the outbreak of the war in Europe, Ernst brought his family back to this country to live. He served as development director of a mid-western chemical company until 1943 when he was persuaded to take the job of coordinating the petroleum interests of lend lease. E. R. Stettinius was head of lend lease at that time.

After the war, Ernst remained in Washington to complete his work with the Foreign Economic Administration and the Department of State. He chairmaned the U. S. Interagency Committee and the combined U.S.-U.K. committee which worked out the petroleum problems involved in the lend lease settlement and economic agreements recently signed between the governments of the United States and of the United Kingdom.

F. M. ROGERS, chief chemist at Standard of Indiana's Whiting laboratories, retired September 1st. Dr. Rogers' career goes back to the days when science was a comparatively minor element in petroleum refining. When he came to Standard Oil in 1908, he was one of two chemists assisting Dr. R. E. Humphreys, who was then chief chemist.

Dr. Rogers worked on various aspects of petroleum refining and was largely responsible for developing a number of new processes and products. As perhaps his most important contribution, he did pioneer exploratory research on cracking, and thus played a part in developing the first successful commercial cracking process, the Burton process.

FIVE new members have been elected to the board of directors of Ethyl Corporation. They are Albert Bradley, executive vice president, General Motors Corporation, and the following vice presidents of Ethyl Corporation: John H. Schaefer, Percy L. Griffiths, Harry W. Kaley, and Stanley T. Crossland. Mr. Bradley takes the seat of Donaldson Brown, who resigned as a director after serving continuously since the incorporation of the company in August, 1924. The other new directors constitute an increase in the number of directors from ten to fourteen.

MICHAEL L. BENEDUM, president of Benedum-Trees Oil Company, has accepted appointment as an honorary trustee of Marietta College. As trustee he will have an opportunity to help decide policies for the new Edwy R. Brown School of Petroleum, opened in the fall of 1945. This school, founded by a bequest of $300,000 from Mr. Brown, former vice-president of the Socony-Vacuum Oil Company, has enrolled a hundred students since its opening, most of them veterans. It offers basic courses, laboratory work, and on-the-job training leading to the degree of bachelor of science in petroleum.

WILLIAM B. CASE has been named assistant to the general manager of transportation and supplies for Shell Oil Co. in New York. Case joined Shell as valuation engineer in the production department in Tulsa in June 1923. In 1928 he went to St. Louis and in 1934 New York. In 1940 he became an assistant in the president's office of Shell Oil and following an assignment as assistant manager of the crude oil department, he was appointed acting manager of that department at Tulsa in April 1942 where he served until his present assignment.

D. K. HARGER has been appointed manager of all refining divisions at the El Segundo refinery of Standard of California. Harger joined Standard in 1926 and has spent 13 of his 20 years with the company at the El Segundo refinery. His latest position was superintendent of the light oil division at the company's Richmond refinery.

GEORGE LEGH-JONES has been elected chairman of Shell Union Oil Corporation to succeed Sir Frederick Godber who recently resigned. Sir Frederick had been a member of the board since 1922 and chairman since 1937. At one time he was president of Shell Petroleum Corp. at St. Louis.

Mr. Legh-Jones has been a member of the Shell Union board since 1925. He was president of Shell Oil Co. at San Francisco for many years and now is a managing director of Shell Transport and Trading Co.

Frank J. Hopwood was elected to the board to fill the vacancy caused by Sir Frederick's resignation. Until recently Mr. Hopwood was president of Asiatic Petroleum Corp. at New York and is now a managing director of Shell Transport and Trading Company.

George Legh-Jones

304 DAYS ON STREAM...

Indiana Farm Bureau Cooperative Association, Inc.

REFINERY DIVISION • P.O. BOX 271
MOUNT VERNON, INDIANA

April 29, 1946

Petroleum Rectifying Company
648 Edison Building
Toledo 4, Ohio

Gentlemen:

In answer to your request for performance data on the Petreco Desalters, I am pleased to state that our refinery, using Petreco Desalters, operated continuously for 7300 hours. This 304 day run started February 13, 1945, and ended December 14, 1945. During this period, the total throughput was 962,610 barrels of Illinois Basin crude, averaging approximately 75 pounds of salt per thousand barrels.

We believe that Petreco Desalting played an important part in this long, trouble-free run, and are convinced that salt removal enables us to manufacture better products, especially fuel oils.

Yours very truly,

INDIANA FARM BUREAU CO-OP. ASSN., INC.

RJP:jvh

Russell J. Potts,
Plant Superintendent
Refinery Division

The Indiana Farm Bureau Cooperative Association, Inc., Refinery operated continuously from February 13, 1945, to December 14, 1945. All the crude processed, 962,610 bbls. of Illinois Basin crude, was first desalted

WITH PETRECO ELECTRICAL DESALTERS

36 TONS OF SALT ELIMINATED AT THIS REFINERY...

...WITH THESE RESULTS!

	Hours on Stream		Throughput	
Date (1945)	Monthly	Cumulative	Bbls./Mo.	Cumulative
Feb. 13-28	375	375	49,629	49,629
March 1-31	744	1119	98,865	148,494
April 1-30	720	1839	95,830	244,324
May 1-31	744	2583	98,574	342,898
June 1-30	720	3303	95,915	438,813
July 1-31	744	4047	98,349	537,162
August 1-31	744	4791	96,025	633,187
Sept. 1-30	720	5511	92,104	725,291
Oct. 1-31	744	6255	100,002	825,293
Nov. 1-30	720	6975	95,758	921,051
Dec. 1-14	325	7300	41,555	962,606
TOTALS	7300		962,606*	

*The crude charge averaged 75 pounds of salt per thousand barrels. At this rate, the Petreco Desalters eliminated 72,195 pounds of salt . . . 36 TONS!

QUALITY FARM BUREAU PRODUCTS

★This is not the first surprisingly long on-stream period which Petreco Desalters have helped to lengthen. Petreco Electrical Desalters stop salt troubles *by eliminating salt.* For full particulars, have a Petreco engineer call on you . . . such consultations are part of Petreco Service.

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PETRECO

DESALTING ★ ELECTRICAL PROCESS ★ DEHYDRATING

B. W. Pickard

George L. Neely

A. L. Baker

B. W. PICKARD has been made manager of the gasoline and fuel oil division of Standard of California marketing department. He succeeds H. G. Vesper, recently named to the presidency of California Research Corporation, a subsidiary. At the same time the company reported the return from military service of Commander George L. Neely to his former position as lubricant division manager.

Neely served with the Navy on special assignment as a "trouble shooter" on engineering problems in the Pacific. At the end of the war he was assigned to head a mission to study the technical development and petroleum position of Japan. The results of this survey, a 10 volume report, were recently submitted to the Navy Department.

A. J. Cunningham Dies

A. J. "Casey" Cunningham, 60, president of Standard Oil Company of Texas, died August 20, in an El Paso hospital, from the effects of a cerebral hemorrhage. He was stricken in El Paso, where he had gone on business from his headquarters in Houston.

Mr. Cunningham joined Standard of Texas as superintendent of the land and lease division in 1923. He later became manager of the company's producing department and in 1941 he was elected president. He also was president and director of Pasotex Pipeline Company at the time of his death.

STANDARD OF CALIFORNIA announces two appointments in its marketing department: T. C. Wellman has been appointed assistant manager of the lubricant division and Douglas W. Smith, superintendent of fuel oil sales for Standard Oil Co. of California. Wellman has been with Standard since 1924 when he joined the company's former bureau of education. During the war he served in the Navy and holds a commendation from Secretary of the Navy James Forrestal. Smith, who joined Standard in 1915, has served 25 years in the fuel oil sales division. He was fuel oil sales representative in the Pacific Northwest for more than 12 years.

A. DOUGLAS MURPHY, JR. manager of the package department of the Standard Oil Company of New Jersey, was recently cited by Secretary of War Robert P. Patterson for his part in aiding the Army Transportation Corps during World War II.

In addition to designing and writing specifications for containers used to transport vital petroleum products to the battle-lines, Mr. Murphy's single greatest contribution to the war effort was his direction of the filling and shipping of five-gallon "blitz" cans for the North African invasion at an east coast port.

W. E. SIEVERS, former president, has been elected chairman and O. Hammer has been elected president and general manager of Security Engineering Co., Whittier, Calif. "Ott" Hammer has been associated with Security since its inception in 1931 when the Sievers reamer was first introduced. Production facilities of Security Engineering are being expanded and new warehouses are being built in Oklahoma City and Odessa, Texas.

J. J. O'DONNELL has been appointed personnel and labor relations manager of the Lummus Company, designing and construction engineers. Mr. O'Donnell was formerly director of personnel for Bendix Aviation Corporation of New Jersey.

FRANK E. PACKARD, general and tax attorney for Standard Oil Company (Indiana), retired September 1 after more than 25 years' service. Mr. Packard joined the company after serving the state of North Dakota as tax commissioner from 1912 to 1918 and attorney general from 1918 to 1920.

Mr. Packard has been for many years chairman of the central division of the American Petroleum Industries committee and as such has been active in the petroleum industry's fight to keep gasoline taxes within reasonable bounds and prevent their diversion, also to prevent the enactment of unfair and unjust laws by the states and federal government regulating or hampering the industry generally. He will continue in this position.

Frank E. Packard

A. L. BAKER, has been elected vice president of the Kellex Corp. and W. H. Denne, Jr., has been made general manager. President H. R. Austin announced that the M. W. Kellogg Co. subsidiary which engineered the k-25 atom bomb plant at Oak Ridge, Tenn., will be continued as a peace-time operation to aid both government and industry. Mr. Baker joined Kellogg in 1934 and helped develop the fluid catalytic cracking process. He was chief engineer in 1942 when he was made project manager for Kellex.

O. N. MILLER has been appointed general manager Standard of California's manufacturing department, in charge of the Richmond, El Segundo and Bakersfield refineries. Only 37 years old, Miller is the youngest man to hold this key job in Standard's history. He succeeds C. E. Finney, Jr., who became a vice president of the company in January.

Miller joined Standard in 1934 after receiving his doctor's degree in chemical engineering at the University of Michigan. In 1943 he was transferred to the Standard affiliate, the Arabian American Oil Company, where his work included planning and designing of the Ras Tanura refinery in Saudi Arabia. On completion of this assignment, Miller became assistant to the general manager of the manufacturing department and then returned to El Segundo as superintendent of the cracking division. In January he became assistant to the vice president in charge of manufacturing.

O. N. Miller

CENTRIFUGAL SEPARATION AND CLARIFICATION

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This is Centrifugal Headquarters . . . our entire efforts are concentrated on designing and building Centrifuges . . . and in creating Centrifugal Processes. The range is wide . . . from the small Laboratory Model, operating at 50,000 R. P. M. . . . to the specialized Continuous Solids Discharge . . . Self Cleaning Rotor . . . Centrifuge for specific applications.

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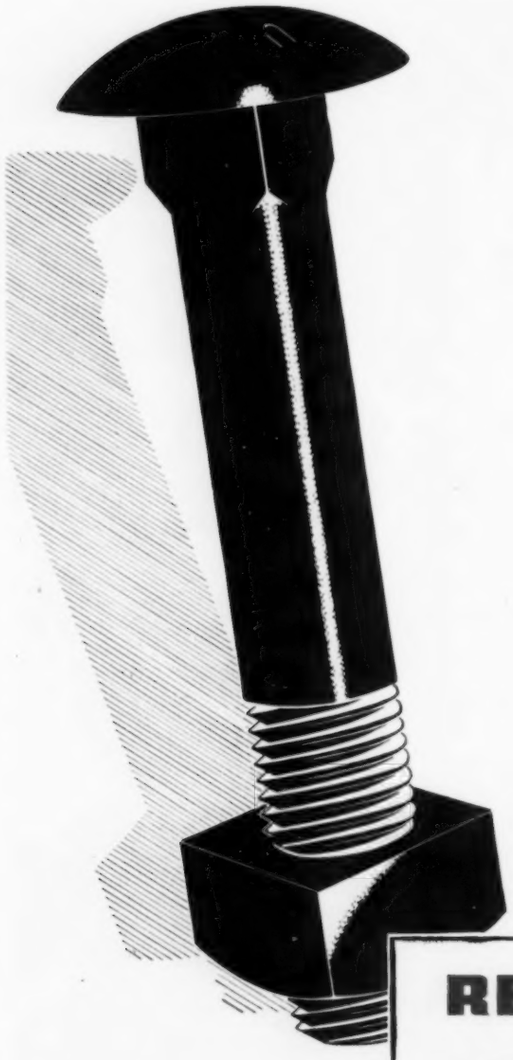

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WORLD OIL PRODUCTION was approximately 7,000,000 barrels a day in 1945. The year produced a new high in domestic crude production of 1,711,000,000 bbl. *Axelson deep well plunger pumps, sucker rods and couplings* brought much of the oil to the surface. . . . Axelson has a pump for every purpose, suitable for any condition, anywhere . . . Axelson Sucker Rods and Couplings are completely reliable, so far as human skill, experience, metallurgy and manufacturing can develop their excellent qualities. . . . All Axelson petroleum equipment products are backed by the company's 54-year *quality first* standard . . . Added up, Axelson merits promise production *up* and costs *down*, anywhere in the oil world.

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Applied with Welding Rods or by Inserts, "CARBOMETAL" gives your bit:

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from Drilling Rig.. *to* Service Station..

Westinghouse serves the Petroleum Industry

Lease-generated power station, with six 625 kva, 2400-volt, 3-phase, 60 cycle, 400 rpm generators.

Splashproof, weatherproof motor, 15 hp, 1200 rpm with high starting torque to assure positive starting under all weather conditions.

Well-testing — a Westinghouse field engineer uses Dynagraph to make polished rod load chart, with pumping unit in operation.

Transformer station outside large lease power plant raising voltage from generated to distribution values.

Weatherproof oil well pumping control, with weatherproof front raised, and dead-front safety door opened. The socket-type voltmeter may be replaced by wattmeter, watt-hour meter, ammeter or time switch to provide automatically-repeating cycles of pumping and idle time.

DECADES of close collaboration with the petroleum industry, together with vast manufacturing facilities and unrivalled research and field organizations, enable Westinghouse to supply a complete line of proved electrical and motive equipment for drilling, pumping, transportation, refining and marketing of oil products.

Here, for example, are illustrated a few of the apparatus specifically designed for more efficient pumping, and for lower operating and maintenance cost. The pumping equipment offered by Westinghouse includes complete substations for utility power, generator sets of every size and type for lease-generated power, transformers, distribution apparatus, pumping motors and gearmotor drives, protective and control apparatus for both generating equipment and drives, Dynagraphs for measuring well loads mechanically, and a full range of electrical instruments.

It will be a pleasure to furnish you with full details of Westinghouse equipment for every phase of the petroleum industry. Please consult the Westinghouse distributor in your locality, or write to Department OL-25, Westinghouse Electric International Company, 40 Wall Street, New York 5, U. S. A.

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International News and Notes

Karl Johnson

Karl Johnson, sales engineer representing all divisions of J. F. Pritchard & Company, has recently been transferred to the firm's Chicago office from Tulsa. Mr. Johnson has been employed by Pritchard since January 1, shortly after he received his discharge from the Navy.

During four years in the Navy, Mr. Johnson served as an engineering officer in both the Atlantic and Pacific theatres of war and held the rank of lieutenant (senior grade) at the time of his discharge. He received his degree in mechanical engineering from the University of Kansas in 1938.

British Visitors

Ten representatives of the Council of British Manufacturers of Petroleum Equipment left London on August 20 for a three-month trip to oil areas in the Caribbean. The British experts will interview oil operators in Trinidad, Venezuela and Colombia to learn how they can be of greater service to the industry. On their return to Britain they will issue a general report for the guidance of all manufacturers of equipment in England.

Leader of the group when it left England was G. R. Bolsover, director and chief metallurgist of Samuel Fox & Co., Ltd., (United Steel Companies). Others in the group are: E. E. Allen, petroleum engineer of the Industrial and Engineering Development Association; H. D. Carter, commercial manager of Head, Wrightson Processes Ltd.; A. G. Ellison, chief research metallurgist of The Yorkshire Copper Works Ltd.; E. T. Forestier, technical consultant to Newman, Hender & Co. Ltd.; E. F. E. Howard, director and sales manager of Hayward-Tyler & Co. Ltd.; Frank Kenyon, joint managing director (technical) of Wm. Kenyon & Sons Ltd.; H. Martin, research engineer of Murex Welding Processes Ltd.; F. Pritchard, London engineer manager of British Oilfield Equipment Co. Ltd.; G. H. Thorne, vice-chairman and assistant managing director of Dawnays Ltd.

More Oil-Burning Locomotives

Twenty-five G. W. R. Castle Class engines—greyhounds of the track—are to be converted to oil-burning at the company's Swindon Works, and will be used on main line services between Paddington—Bristol—the West of England and South Wales. The company has already converted ten freight locomotives to oil-burning and these are in service in South Wales. Eight more are to be converted. A locomotive of the Hall Class, a general utility type, has also been converted and is to be brought into service shortly on express passenger services between Paddington and Bristol.

Houston Nomads Meet

Five structures between the Pyrenees and Marseille have been mapped and are to be drilled by French interests E. D. Lynton of the Institut du Petrole, told Houston Nomads at their recent meeting. American drilling equipment is being imported for the tests.

Rodolfo M. Fernandez of Petroleos Mexicanos, predicted that oil exploration in Mexico will be increased greatly by the new administration which comes into office on December 1. Domestic consumption of oil is growing rapidly and Pemex is anxious to develop its export outlets.

Five Day Working Week

The Renold and Coventry Chain Company Limited is introducing for all employes a five day working week at Renold Works, Manchester and Coventry Chain Works, Coventry. Standard hours will be reduced from 47 to 43 per week by eliminating work on Saturday morning; wage rates and piece work prices are being adjusted to yield the same earnings. The company's central office at Manchester and its branch offices also will be closed on Saturday mornings.

The late Hans Renold, the founder of Hans Renold Ltd., one of the predecessors of this company, was among the first employers in Manchester to introduce in 1896 a 48 hours week. Demand for the company's products is very heavy at the present time, but the company believes that the adoption of shorter working hours will not affect the volume of production.

Take Over Japanese Oil

Representatives of the five leading American and British oil companies have incorporated the Japan Oil Storage Company to handle military petroleum supply in Japan, Allied Headquarters has announced.

The corporation which was formed in Delaware was organized by Standard Vacuum Oil, Shell Oil, California-Texas Oil, Tidewater Associated Oil, and Union Oil Companies. Company spokesmen estimate that about twenty U. S. oil experts will work in the Japan office of the firm, in Yokohama. Claude Ettelee of New York will go to Japan as general manager.

JOSCO will take over its duties—storage and distribution of all military petroleum imports—on September 1. The company will handle only military petroleum supplies. According to Allied Headquarters, this job is being given to a civilian contractor in order to release army men who are now engaged in this work. The company plans to employ some experienced Japanese technicians, many of whom worked for foreign oil companies before the war.

Venezuelan Representative

Leonard C. Borrell has been appointed special representative in Venezuela for United States Rubber Export Company, Ltd. Mr. Borrell will make his headquarters in Caracas and will be in charge of oil field service throughout Venezuela and refinery service on the islands of Curacao and Aruba. Among the products which Mr. Borrell will handle are rotary hose, suction and discharge hose, transmission belting, packings, boots, wire and cable.

Motorists Grumble

There has been considerable dissatisfaction in the United Kingdom with the recent increase in gasoline rations. The 50 percent increase amounts to only about three miles per day of added travel and was considerably less than had been anticipated.

Motorists point out that the black market is flourishing with gasoline at 5s per gallon in London. They think it unfair that bus companies can obtain unlimited quantities for private tours while the ordinary motorist cannot use his own car for holiday trips.

Opens Offices in Mexico

W. Y. DeMouche has been appointed as the Hunt Tool Company representative in Mexico City with offices at Paris 12. DeMouche has had wide experience in the Mid-Continent fields of the United States in both drilling and production practices.

Acquires New Factory

The Renold and Coventry Chain Company, Ltd., precision chain engineers, of Didsbury, Manchester, has acquired an additional factory. The new plant at Cardiff with a floor area of 130,000 square feet will aid in supplying much needed facilities to meet the increasing pressure of power transmission business. The factory was built in 1941 as a war plant and is completely equipped with fine offices and modern facilities.

Steel Production Movie

A FIVE-REEL sound film entitled "The Production of High Quality Steel" has been prepared by Hadfields Ltd., for lending to technical societies, institutions, business firms and foreman panels. The 45-minute film is available for either 16 or 35 mm. sound projectors.

The film already has been shown with success before some 50 industrial and technical groups. Applications for loans should be made to the company at its East Hecla Works, Sheffield 9, England.

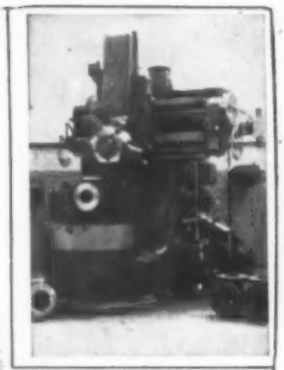
Mexico to Get More Texas Gas

The long pending proposal for the shipment of gas from Texas fields to supply industries in the Monterrey district of Mexico received the approval of the Federal Power Commission on June 12. The Commission's order authorizes the Reynosa Pipe Line Co. to export and sell up to 40 million cubic feet of natural gas daily. Supplies will be drawn from the fields of La Gloria Corporation in southwest Texas and their movement will require the construction of a pipe line 30 miles in length on the Texas side of the border to connect with a Mexican line from the border of Monterrey.

Visits Australian Plants

W. E. Zander, director and vice president of foreign operations for Rheem Manufacturing Company, is on a tour of the company's Australian plants. He will visit company operations at Sydney, Melbourne and Brisbane.

"SENTINEL" OIL VALVES travel the path of PRECISION on the latest type machines & equipment MADE



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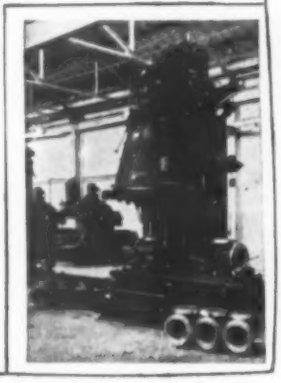

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This North American Gravity Meter is portable in the fullest sense of the word. One man can carry it without difficulty to the most remote locations on the back-pack. It can be mounted in a standard sedan or small "Jeep" for operation wherever a car can go. It is not necessary to remove the Meter from the car. The tripod can be lowered through the car floor and reading made in less than two minutes.

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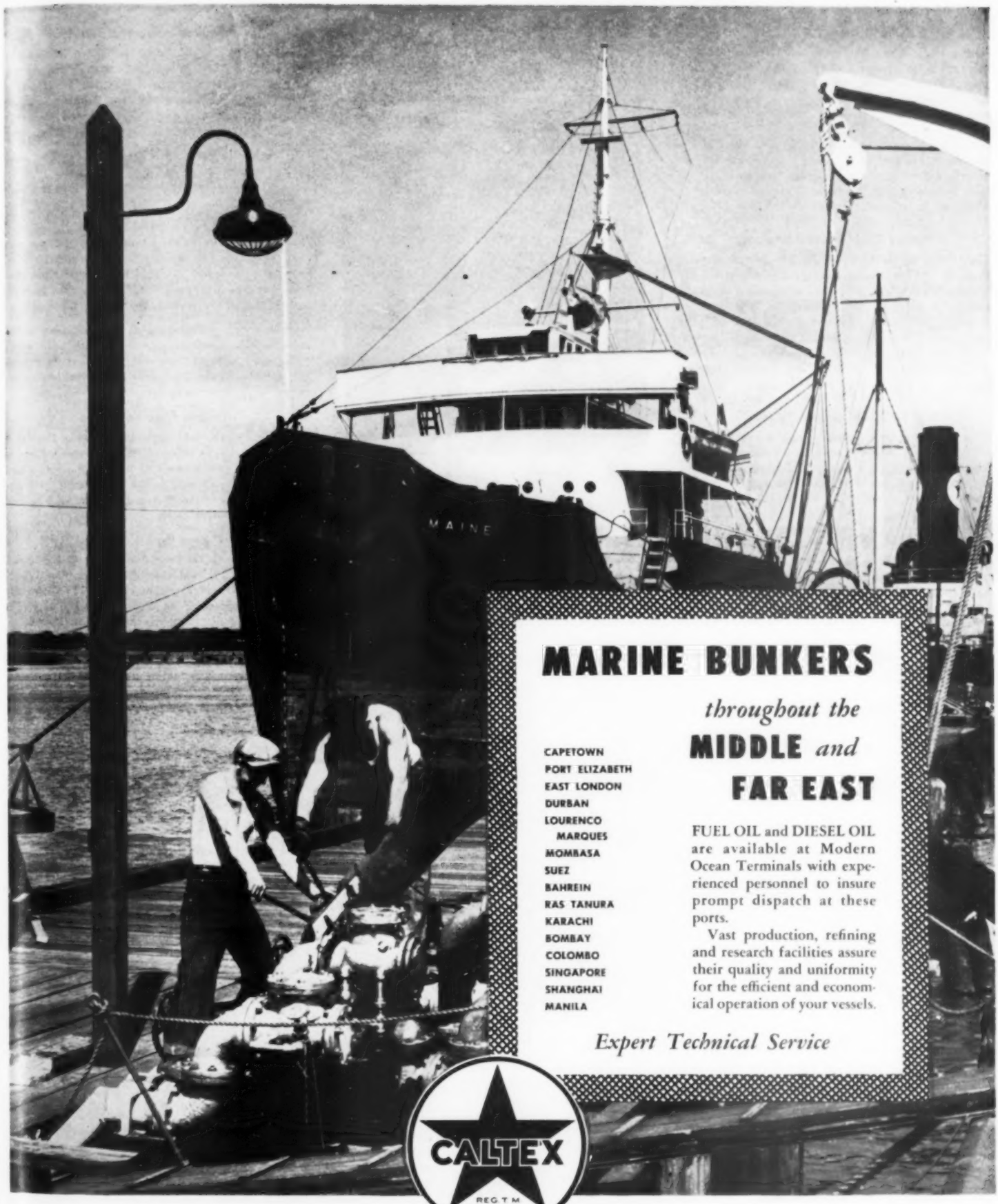

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Named Export Manager

Theodore A. Dyke has been appointed manager of the export division of Combustion Engineering Company, Inc., New York, manufacturer of steam boilers, fuel-burning equipment of all types and related heat-recovery equipment. He succeeds the late J. B. Crane.

Mr. Dyke joined Combustion in 1936. Over the past ten years he has been closely identified with the numerous foreign contracts of his company, particularly those pertaining to Latin American countries in which he has traveled extensively.

Named Chief Process Engineer

GORDON B. ZIMMERMAN has joined Bechtel Brothers McCone Co. as chief process engineer. He comes to his new position with a background of fifteen years with Universal Oil Products Co. in research at Riverside and in design and development of pilot plant and commercial cracking, isomerization and alkylatation. He has been loaned to the government in recent months for service on the strategic bombing survey of oil and chemical plants in Japan.

Heads Oil Industry Sales

I. K. Farley has been named petroleum industry sales manager of the Brown Instrument Company. R. A. Schlegel has been transferred from the Chicago office to New York office where he will succeed Mr. Farley in charge of petroleum accounts in the New York area.

T. S. Scibienski and John F. Lynch, who have been with La Gloria Corporation, Corpus Christi, Texas, for the past two years, have recently been elected vice presidents. Mr. Lynch also represents LaGloria on the board of Carthage Hydrocol, Inc.

John J. Sheerin has resigned as vice president but will continue as a director, and E. C. Will, who also resigned as vice president, will remain with the company as a consultant.

P. M. Dinkins

P. M. Dinkins of American Cyanamid Company, has been made president and a director of Jefferson Chemical Company, Inc., organized by American Cyanamid and The Texas Company to produce chemicals from petroleum and petroleum gases. Its first plant, now under construction at Port Neches, Texas, will produce intermediate chemicals used in the synthetic rubber, plastics, textile, and other industries.

Acquires Interest in Barber

Standard Oil Co. of California is acquiring an interest in the Barber Asphalt Company's refinery and marine terminal at Perth Amboy, N. J. If Barber stockholders agree the California Refining Company will be organized jointly by Barber and California Standard to operate the refinery and terminal.

The Barber refinery has a capacity of 15,000 barrels of crude daily. It will process Gulf crudes produced by The California Company, another Standard subsidiary.

Standard of California began marketing gasoline in the jobbing trade in the north Atlantic Coast area some months ago through the California Oil Company, when it leased terminal facilities at Perth Amboy. The new arrangement will reduce costs by eliminating part of the long sea haul from California.

Announcement of the new deal follows closely on another by T. Rieber, chairman of Barber, in which Venezuelan interests were sold to Shell for a reputed $25 millions. This latter deal also is subject to approval by Barber stockholders.

Returns from Venezuela

DAN DUNCAN, field engineer for Emsco Derrick & Equipment Co., has returned from an extended trip to Venezuela, where he assisted in setting up two new rigs for Socony-Vacuum in the Guico area. He also spent some time in the Maracaibo region with several companies operating there.

Opens Export Office

EXPORT offices are being opened at 42 Broadway, New York, by Mid-Continent Supply Co., Fort Worth. R. E. Elmore is manager in charge. The company also is opening offices in the Bankers Building, Los Angeles, under the management of L. A. Pyeatt.

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B.N.F. PATENT No. 308647-1929
HEAT EXCHANGER & CONDENSER TUBES
"YORKSHIRE" TUBES
SEAMLESS DRAWN TUBES IN COPPER, BRASS, 'YORCALBRO' (ALUMINIUM-BRASS), CUPRO-NICKEL, ALUMINIUM AND TIN BRONZES AND ALL NON-FERROUS ALLOYS
We specialise in the manufacture of seamless drawn Heat Exchanger and Condenser Tubes for the Oil Industry.
'Yorkshire' Copper and Brass Tubes for Non-Ferrous Pipe Lines in Refineries.
Quickly and economically fixed 'Yorkshire' Capillary Type Fittings.
Details and Price List on application.
Our Research Department will be pleased to advise on any matter connected with the service of Non-Ferrous Tubes for the Oil Refining Industry.
The YORKSHIRE COPPER WORKS LIMITED
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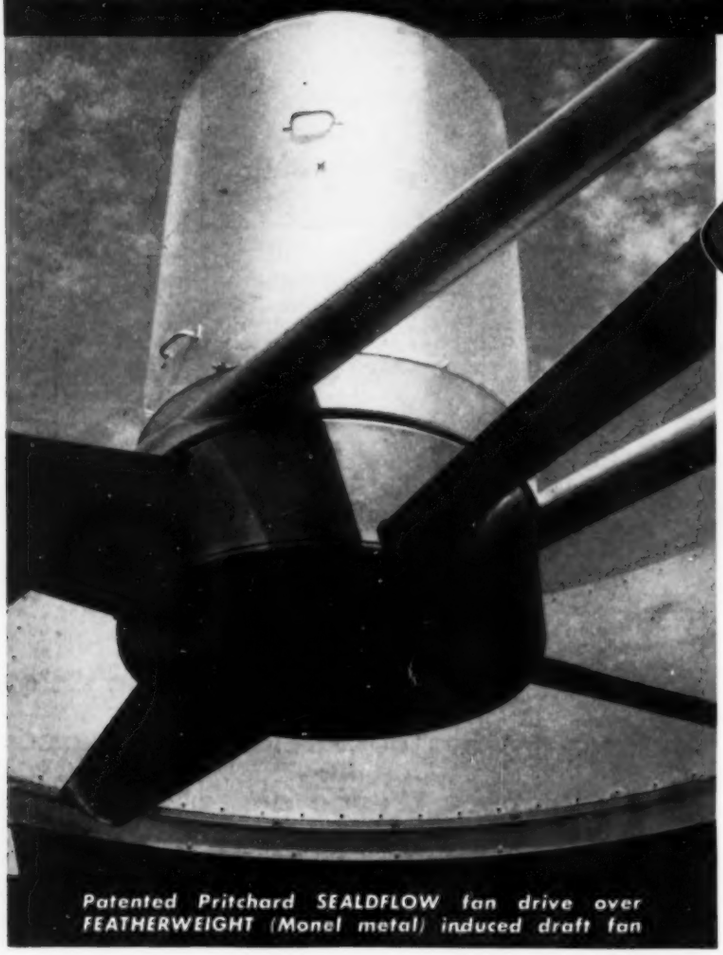

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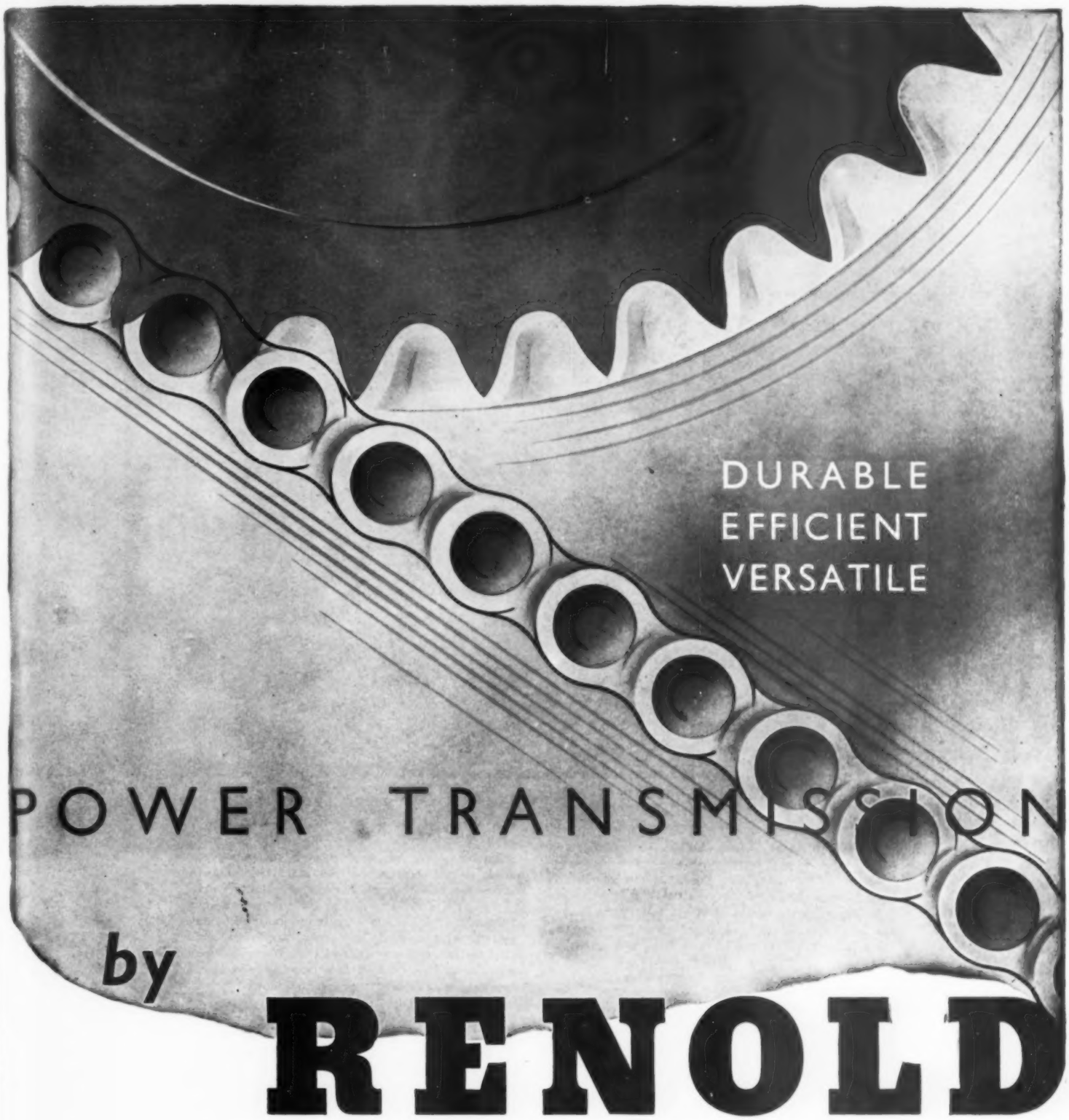

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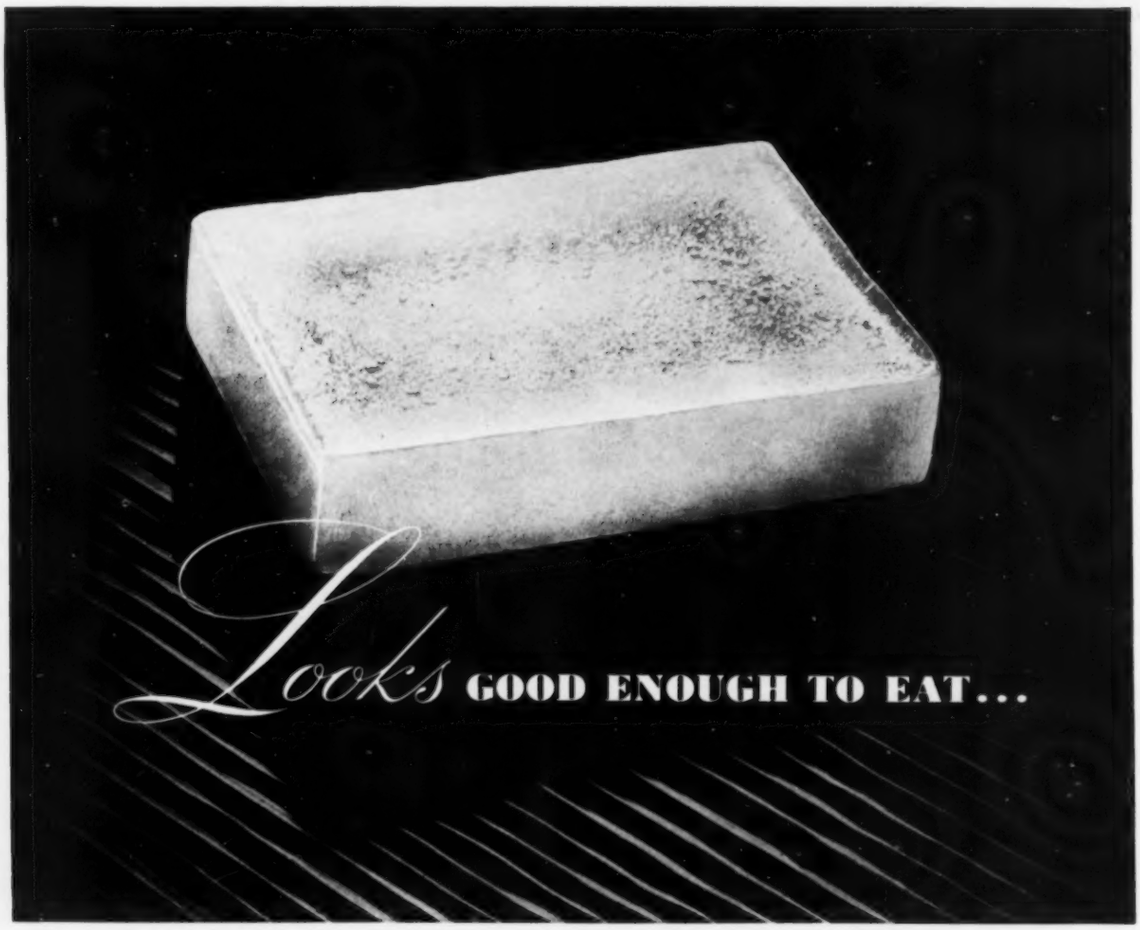

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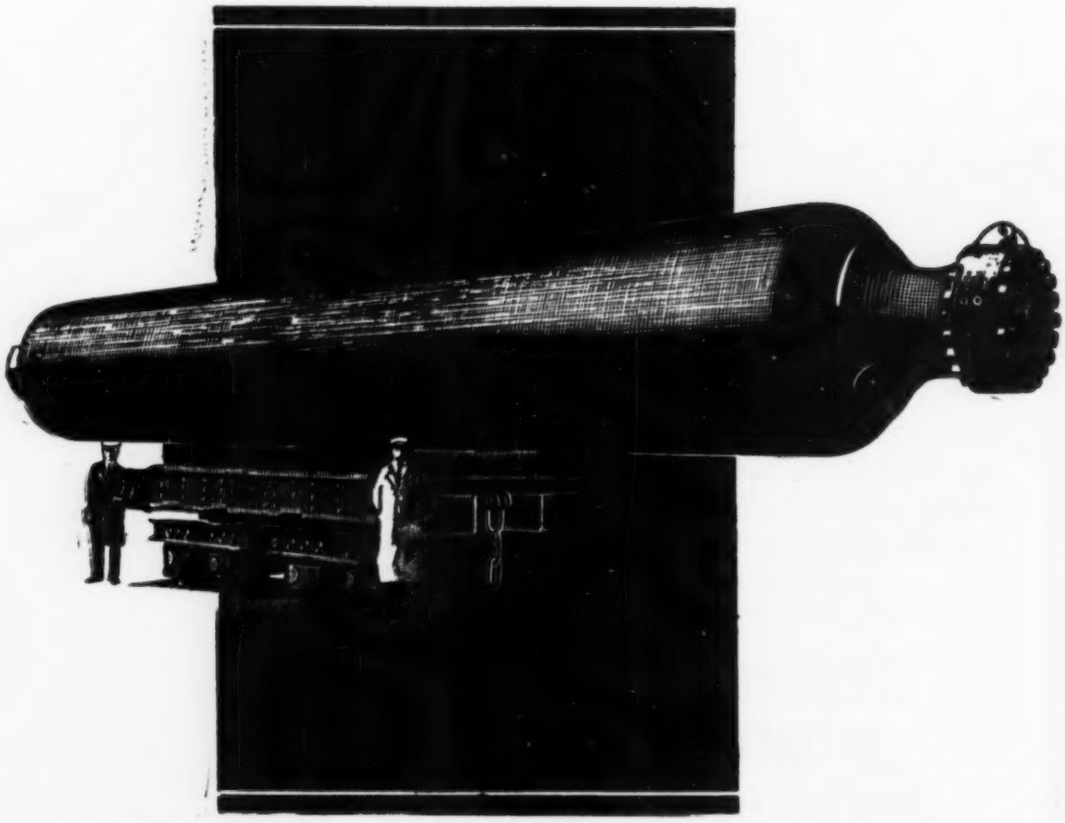

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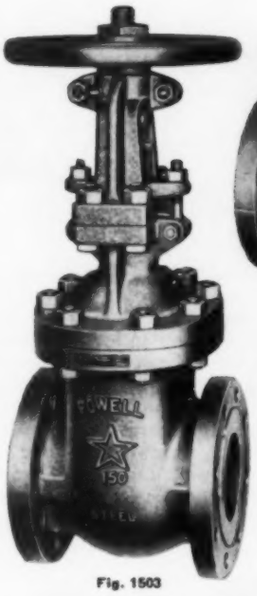

Fig. 1503

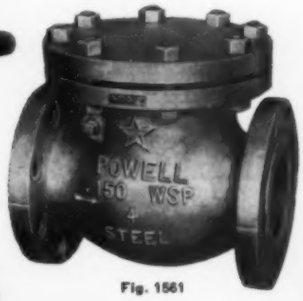

Fig. 1561

Fig. 1561—Class 150-pound Cast Steel Swing Check Valve with flanged ends and bolted cap. Disc, when wide open, permits full unobstructed flow through the valve body.

Fig. 1793

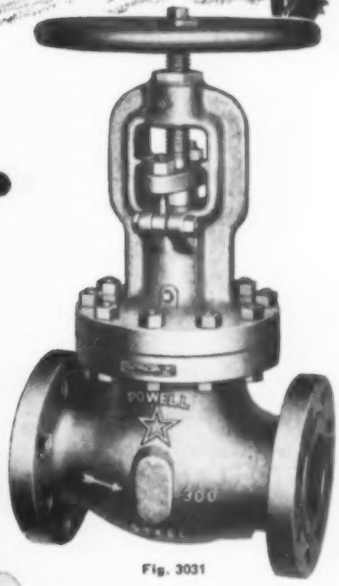

Fig. 3031

Fig. 1503—Class 150-pound Cast Steel Gate Valve. Has flanged ends, outside screw rising stem, bolted flanged yoke and taper wedge solid disc.

Fig. 1793—125-pound Iron Body Bronze Mounted Gate Valve with flanged ends, outside screw rising stem, bolted flanged yoke, bronze seat rings and taper wedge solid disc. Also available in All Iron.

Fig. 3031—Class 300-pound Cast Steel Globe Valve with flanged ends, outside screw rising stem and bolted flanged yoke.

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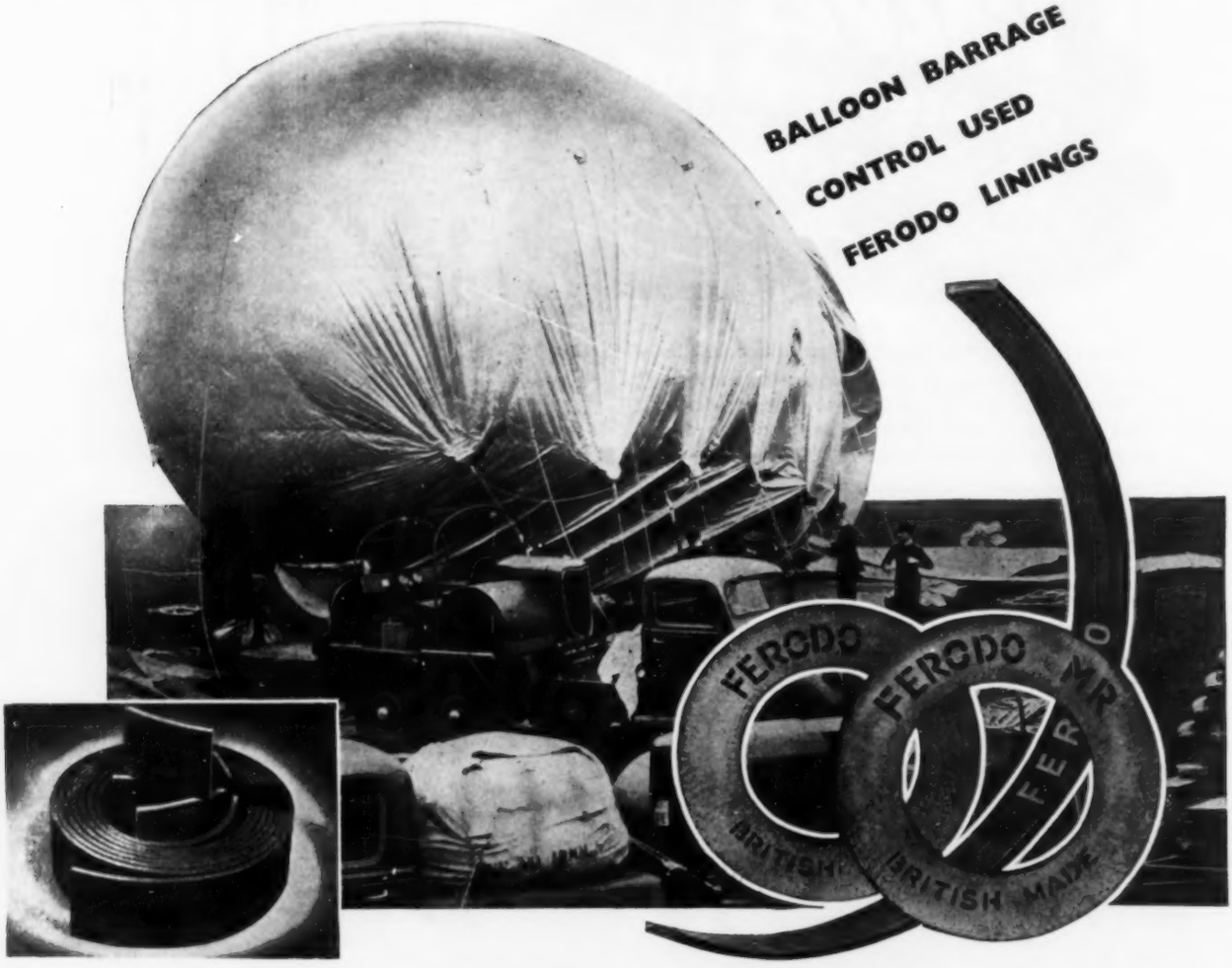

The balloon barrage used in air defense on land and sea provides another instance of the varying duties performed by Ferodo Friction Materials during the war. The tension of the steel cable on the winches employed in the ground equipment had to be carefully controlled to avoid breakage while the balloons were raised or lowered. This duty threw great stress on the clutch and brake linings, especially when the balloons were riding in rough weather, a stress that Ferodo materials withstood with the greatest efficiency. With their many war-time tasks completed, Ferodo Limited are now able to offer to the Petroleum Industry the same high quality materials for peace-time needs. Friction materials which have successfully stood up to the exacting tests of battle. Friction materials in which are incorporated the fruits of nearly fifty years' relentless research and experiment. In drilling operations, no matter what strain is placed on drawworks brakes, the correct type of Ferodo Friction Products can be obtained with co-efficients of friction that remain uniform under working conditions. Extremely durable, these Ferodo Linings ensure long wear, obviate the need for frequent renewal and loss of working hours, and thus reduce overhead expenses. It pays to specify Ferodo Friction Materials for maximum brake efficiency.

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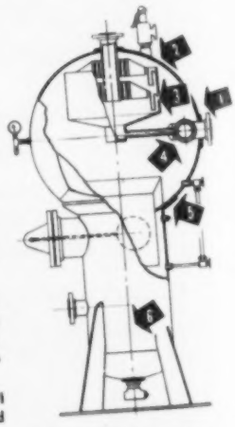
5. The bottom portion of the spherical shell surface provides a retarding action through the spreading of the fluid in a thin sheet to permit escape of entrained gases, whereas in a conventional cylindrical separator the incoming fluid is plunged directly into the oil body.

6. The bottom fluid reservoir effects a relatively small "hold back" capacity but provides adequate depth of fluid for sealing.



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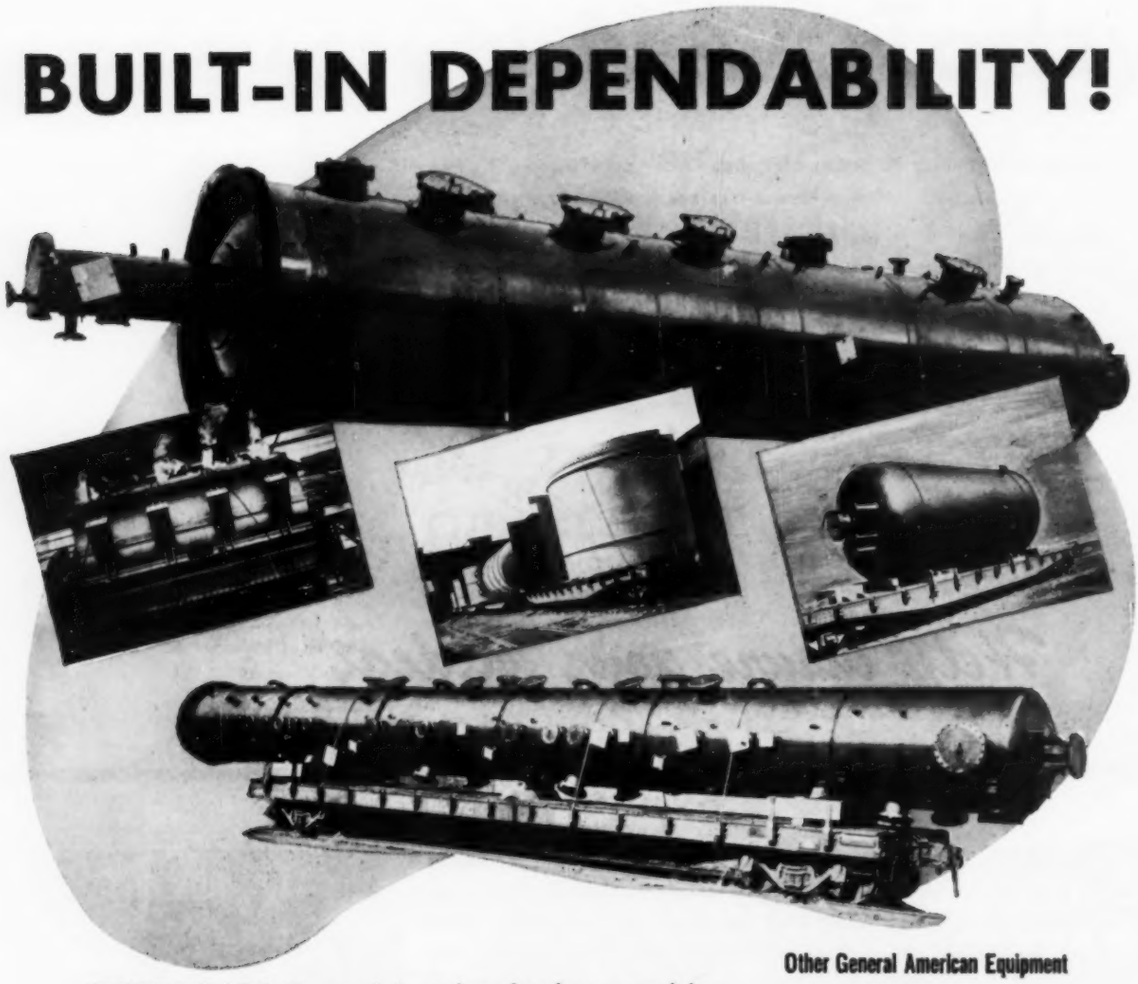

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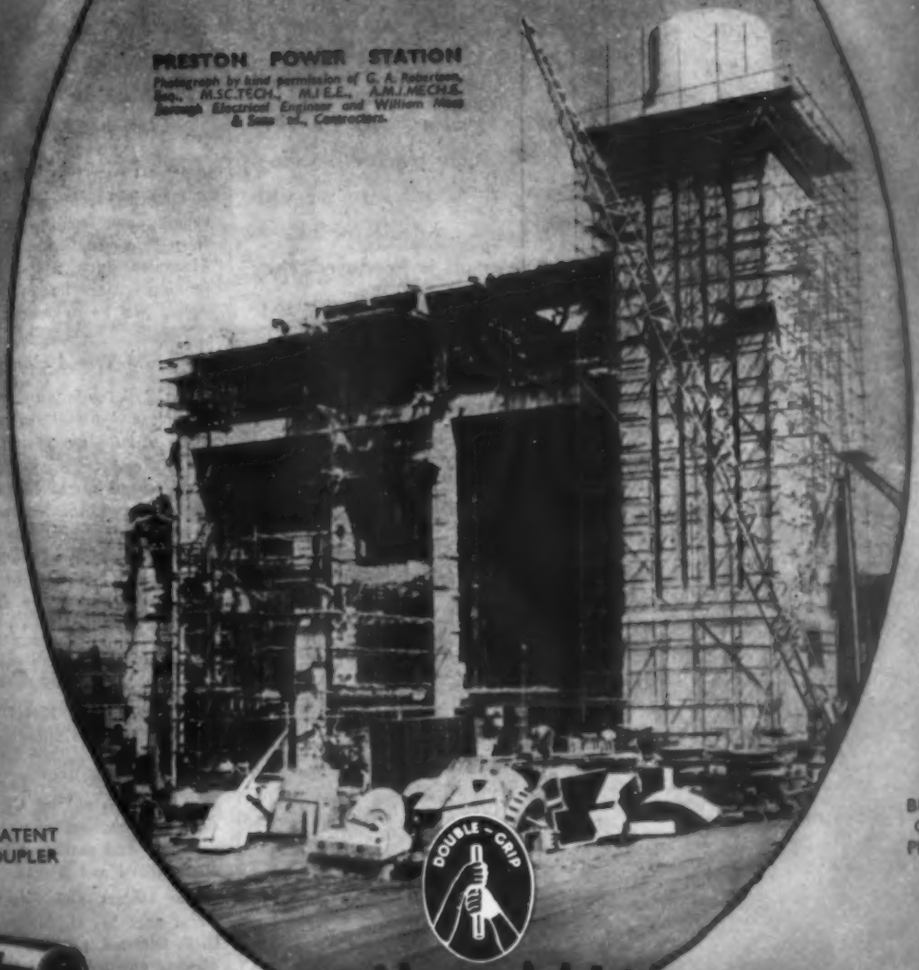
BURTON'S PATENT DOUBLE COUPLER

BURTON'S PATENT SWIVEL COUPLER



PRESTON POWER STATION
Photograph by kind permission of G. A. Robertson, Esq., M.Sc.Tech., M.I.E.E., A.M.I.Mech.E. Borough Electrical Engineer and William Moss & Sons Ltd., Contractors.

BURTON'S PATENT PUTLOG COUPLER

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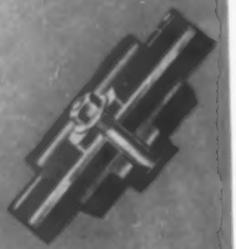

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Improved Houdry Process

The Houdry Process Corporation announces that a major improvement has been effected in the Houdry catalytic cracking process. This improvement, which has been thoroughly demonstrated in the refineries of the Sun Oil Company, has been brought about by redesigning the reactor tubes and by changing the physical composition of the catalytic mass.

The principal change in the design of the reactor consists in rearranging the form of the reactor tubes so that they are easily removable when the time comes (on the average once in 18 months) for replacing the old catalyst with fresh. One effect of the new design is that the tubes and their appurtenances take up less space in the reactor. Advantage is taken of this gain of space to increase the heat capacity of the catalyst mass, which is done by mixing the catalyst with a granular, chemically inert material which has a high volumetric heat capacity. The volume of this added material is equal to the space gained by redesigning the tubes, so that the volume of working catalyst in the reactor remains the same.

Existing Houdry fixed-bed units can be converted to the new type simply by changing tubes, jacket liner and top tube sheet. In the new design the cooling surface has been substantially decreased and the interlocking fins eliminated to insure free flow of catalyst when a change is due. This and other features greatly reduce the down time when catalyst is changed. The chemically inert material limits the temperature rise of catalyst during regeneration and the temperature drop during on-stream periods. Increased production of gasoline also results from the new design, due to higher on-stream efficiencies with more efficient distribution of oil vapor and regeneration air through the catalyst, and the presence of a greater supply of heat for the cracking reaction.

Clement M. Gile

CLEMENT M. GILE has been elected vice president of Gulf Oil Corp. and of Gulf Research and Development Corp., succeeding W. V. Hartman, retired. He will be in charge of marketing. Mr. Gile joined Gulf in 1926 as assistant to the general sales manager. In 1933 he was appointed general manager of refined oil sales. He has been vice president of Gulf Tire and Supply Co. since it was organized.

ARTHUR G. McKEE & COMPANY, Cleveland, designing and construction engineers in the petroleum refining and iron and steel industries, have opened sales offices in Chicago in the McCormick Building. Macauley Carter, who has been identified with oil refining engineering and construction for over twenty years, will be in charge of this new office.

World Conference Deferred

SINCE formulation by the American Institute of Mining and Metallurgical Engineers of the original plans to hold the World Conference on Mineral Resources in New York City next September 16 to 18, requirements for hotel accommodations for the United Nations have been increased to such an extent that it is now evident it will not be possible to accommodate the projected World Conference in New York at the same time. Directors of the A.I.M.E. have therefore voted to postpone the Conference and 75th annual meeting until the week of March 17, 1947.

Tankship Company Formed

OVERSEAS TANKSHIP CORP. has been organized by Standard of California and The Texas Co., with an authorized capital of $2,000,000 and a paid in capital of $100,000. The corporation's headquarters will be in New York City. It will operate a fleet of tankers throughout the world in transporting petroleum produced and marketed by the joint foreign interests of Standard and Texas.

The officers and directors of Overseas Tankship Corp. are: W. H. Pinckard, chairman of the board; C. E. Olmsted, president and director; A. E. Thayer, director and secretary; H. M. Herron, B. W. Letcher, J. H. MacGaregill, J. H. Ruskin and A. E. Van Duser, directors, and William Kunstadter, treasurer and comptroller.

Appoints New York Manager

A. Robert Meyer has been appointed American representative of the Oil Well Engineering Company, Ltd. and manager of their New York office in succession to E. T. Landgraff, who resigned to join the Chiksan Company. Mr. Meyer has spent the last 3½ years in the U. S. Army Air Force and previously was in the employ of the National Supply Company at Toledo, Dallas and elsewhere for a period of about 14 years.

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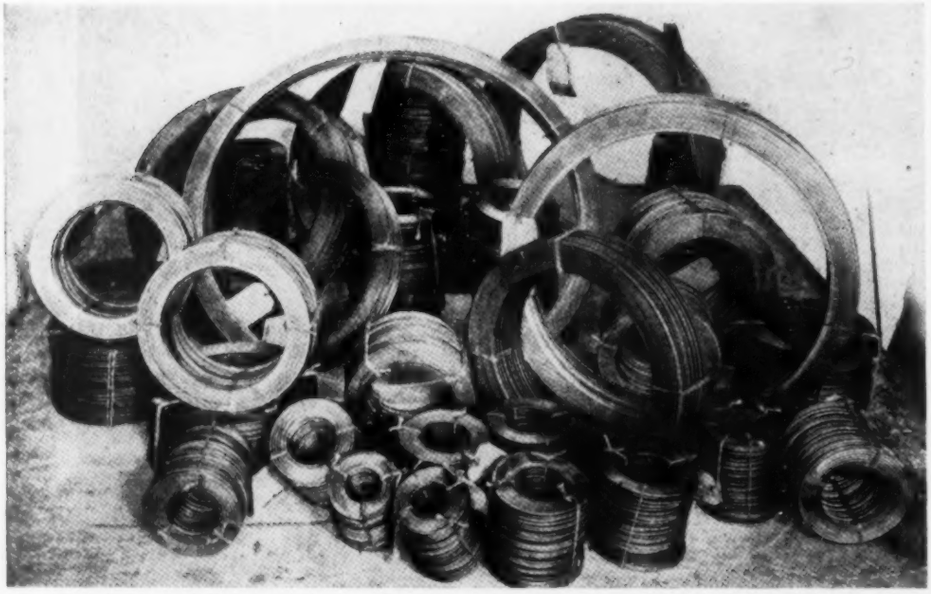

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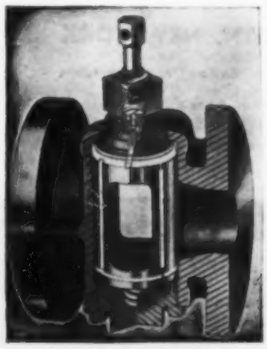

★ This sectioned illustration of a flanged Newman - Milliken Valve shows the cylindrical plug and lubricant ducts which seal the valve against leakage and ensure easy operation at all times. A rectangular port valve is shown, but full round port valves are also manufactured.

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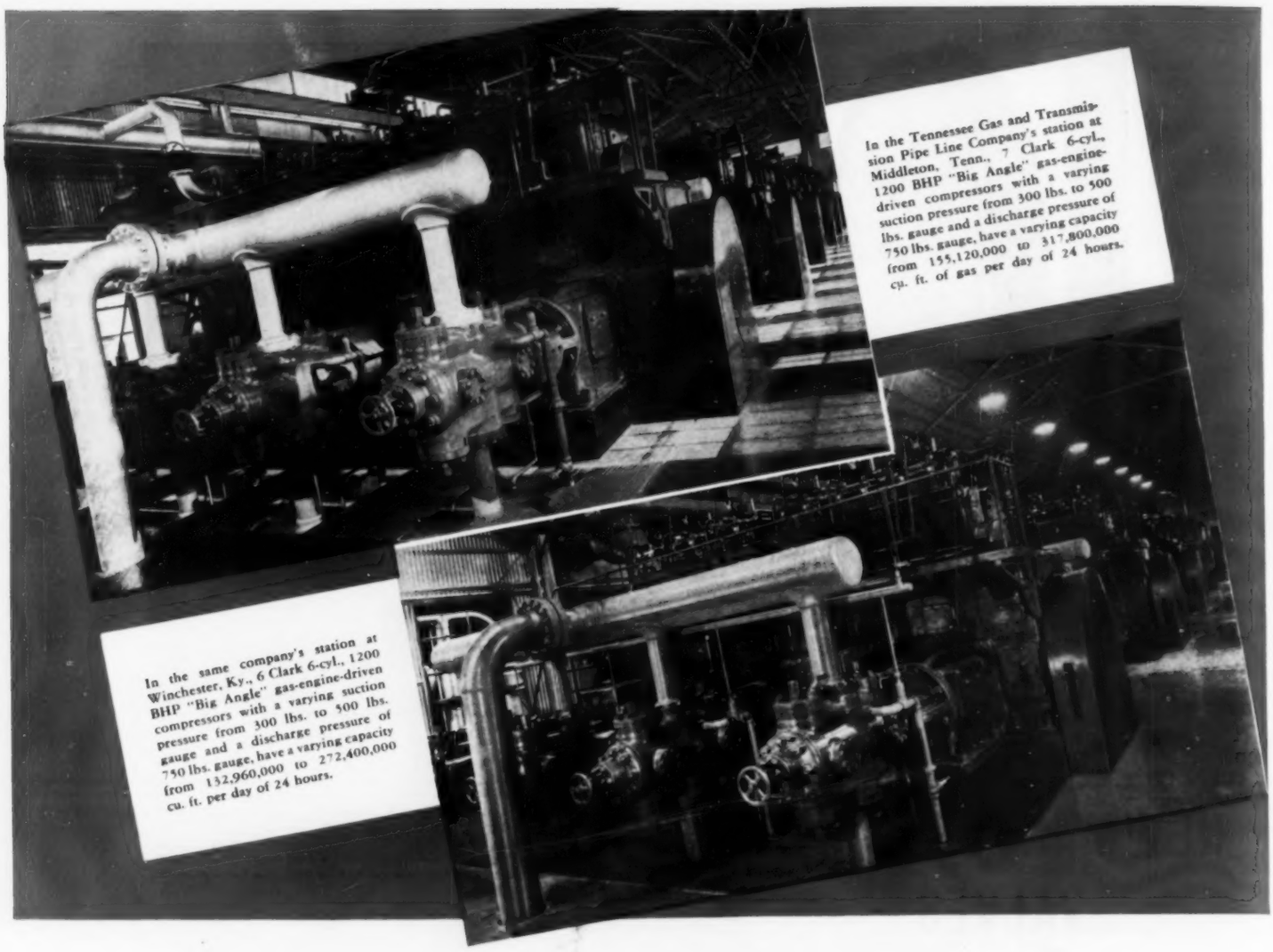
Brazil (South) Cia Touzeau S'A AV. Brigo Luiz Antonio 1725, Sao Paulo : also at Rio de Janeiro.
Brazil (North) : A. O. Sobrinho, T. Campas Salles 17-10, Para.
Colombia : Dr. Bernhard Mendel ,Apartado 18-70, Bogota.


In the Tennessee Gas and Transmission Pipe Line Company's station at Middleton, Tenn., 7 Clark 6-cyl., 1200 BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge and a discharge pressure of 750 lbs. gauge, have a varying capacity from 155,120,000 to 317,800,000 cu. ft. of gas per day of 24 hours.
In the same company's station at Winchester, Ky., 6 Clark 6-cyl., 1200 BHP "Big Angle" gas-engine-driven compressors with a varying suction pressure from 300 lbs. to 500 lbs. gauge and a discharge pressure of 750 lbs. gauge, have a varying capacity from 132,960,000 to 272,400,000 cu. ft. per day of 24 hours.

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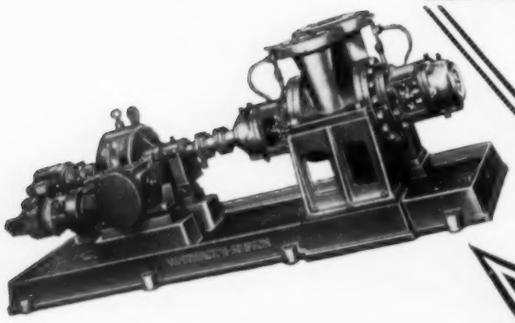
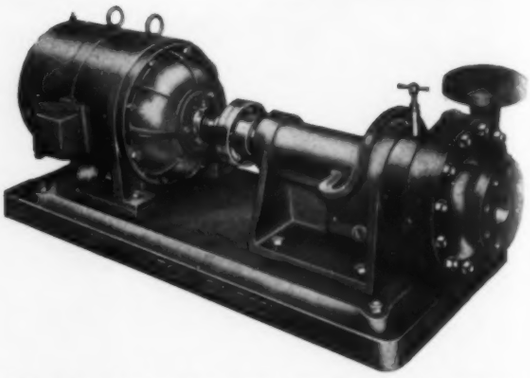
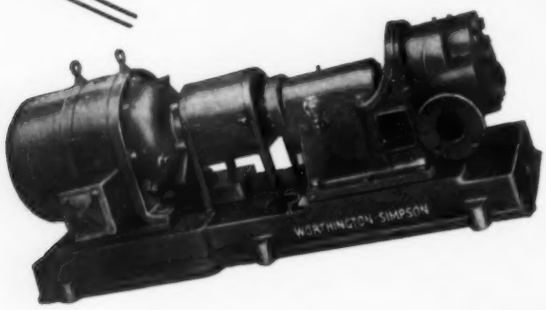


PUMPS FOR REFINERY SERVICE





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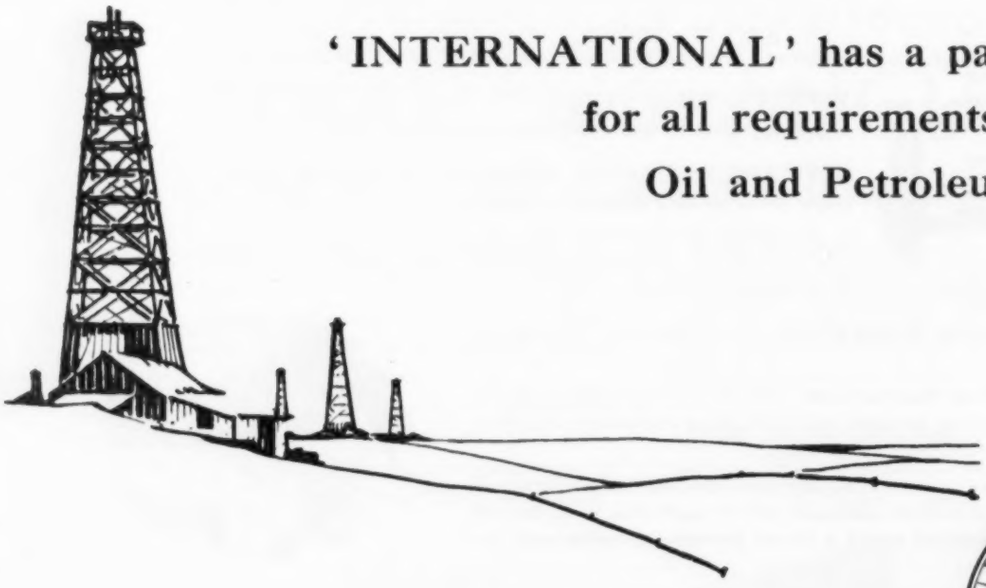

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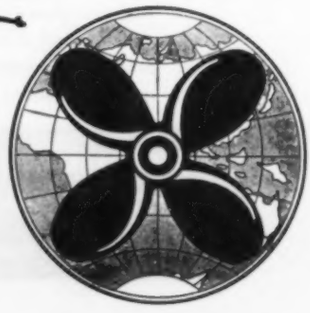

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Goble Heads National Tube

JOHN E. GOBLE has been elected president of National Tube Company, succeeding Charles R. Cox, who has become president of Carnegie-Illinois Steel Corporation, another U. S. Steel subsidiary. Serving as vice president in charge of sales, National Tube Company, since January 1, 1936, Mr. Goble has been with U. S. Steel and companies now affiliated with U. S. Steel for the last 21 years.

Following his service in World War I, he returned to the oil fields of Texas and worked as a driller until 1925 when he joined the Oil Well Supply Company as South American representative, having his headquarters for four years at Maracaibo, Venezuela, and during this period traveled extensively throughout South America and Europe. In 1929 he was transferred to the New York office of the Oil Well Supply Company as assistant manager, export division. He was promoted to manager of the division two years later, and remained in this position until he became vice president of National Tube in 1936.

New Chief Engineer

E. W. Chapman has been appointed chief engineer of the newly created industrial pump division of Bowser, Inc. with headquarters in Fort Wayne, Indiana. He was formerly chief engineer of Blackmer Pump Company, Grand Rapids, Michigan, and has been active in the pump industry for the past 15 years.

Will Produce Epichlorohydrin

First commercial production of glycerin epichlorohydrin, a chemical derivative from petroleum, will take place in the plant that Shell Chemical Company is completing at Houston, Texas. Epichlorohydrin is obtained from propylene gas and is expected to find uses in the manufacture of plastics, fumigants and industrial solvents. Other principal products of the $3,000,000 Houston plant will be acetone and isopropyl alcohol.

Appointed Sales Manager

EDWARD W. WELP has been made sales manager of water conditioning equipment of Graver Tank & Mfg. Co., Inc., of East Chicago. As former technical director of Graver's process equipment division, he has spent 32 years with the firm in every phase of research, design and construction of water conditioning equipment.

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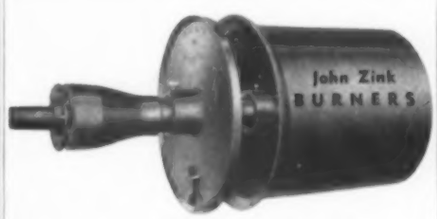

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Guy George Gabrielson

GUY GEORGE GABRIELSON has been elected president of Carthage Hydrocol, Inc., $19,000,000 company recently organized to manufacture gasoline from natural gas. He has been general counsel of the new company since its organization. He will retain that position and continue his general practice of law in New York and New Jersey.

FLOYD C. BROWN, vice president and general manager of Natural Gas Pipeline Co. of America since its organization, has been elected president, succeeding W. Alton Jones. He will continue as general manager. Mr. Brown also was elected president of Texhoma Natural Gas Co. and Quadrangle Gas Co.

Mr. Brown joined the Empire Companies in 1917 and served as chief engineer, assistant general manager and vice president. When Continental Construction Co. was formed in 1930 to build the $60 millions gas line from Texas to Chicago he was chosen to supervise construction.

ROBERT B. CURRAN and Paul C. Shea of Billings, Mont., have been elected vice presidents of Carter Oil Co. Mr. Shea also has been made a director. He will be vice president in charge of refining. Mr. Shea's election comes after 20 years in the New Jersey organization, beginning as a refinery helper at the Colonial Beacon plant at Everett, Mass. He was a vice president of Beacon and manager of the refinery when transferred to Carter in 1945. Mr. Curran will remain at Billings as Northwest division manager while Mr. Shea will move his headquarters to Tulsa.

CLARENCE T. SMITH Flora, Ill., attorney and independent oil operator, has assumed his duties as Illinois representative on the Interstate Oil Compact Commission. Smith was Illinois representative on the Compact Commission in 1941-43, resigning because of ill health and personal business. He is a director and general counsel of the Illinois Oil and Gas Association, was formerly Illinois director of the Independent Petroleum Association of America.

DR. CLAUDE PEAVY, chief process engineer in the refinery engineering division of Socony Vacuum Oil Co., has resigned to become head of the process design division of Houdry Process Corp. The division is being expanded to perform complete process studies and design for small refinery units.

P. C. Spencer

P. C. SPENCER, general counsel of Sinclair Oil Corporation, has been appointed a member of the American Petroleum Industries Committee to succeed the late Grattan T. Stanford, who was also general counsel for Sinclair.

Mr. Spencer became associated with the legal department of the Sinclair Oil Corporation in 1934 and moved to New York. He was elected general counsel last May. He is also president of Southwestern Development Company and of Canadian River Gas Company and vice president of Colorado Interstate Gas Company.

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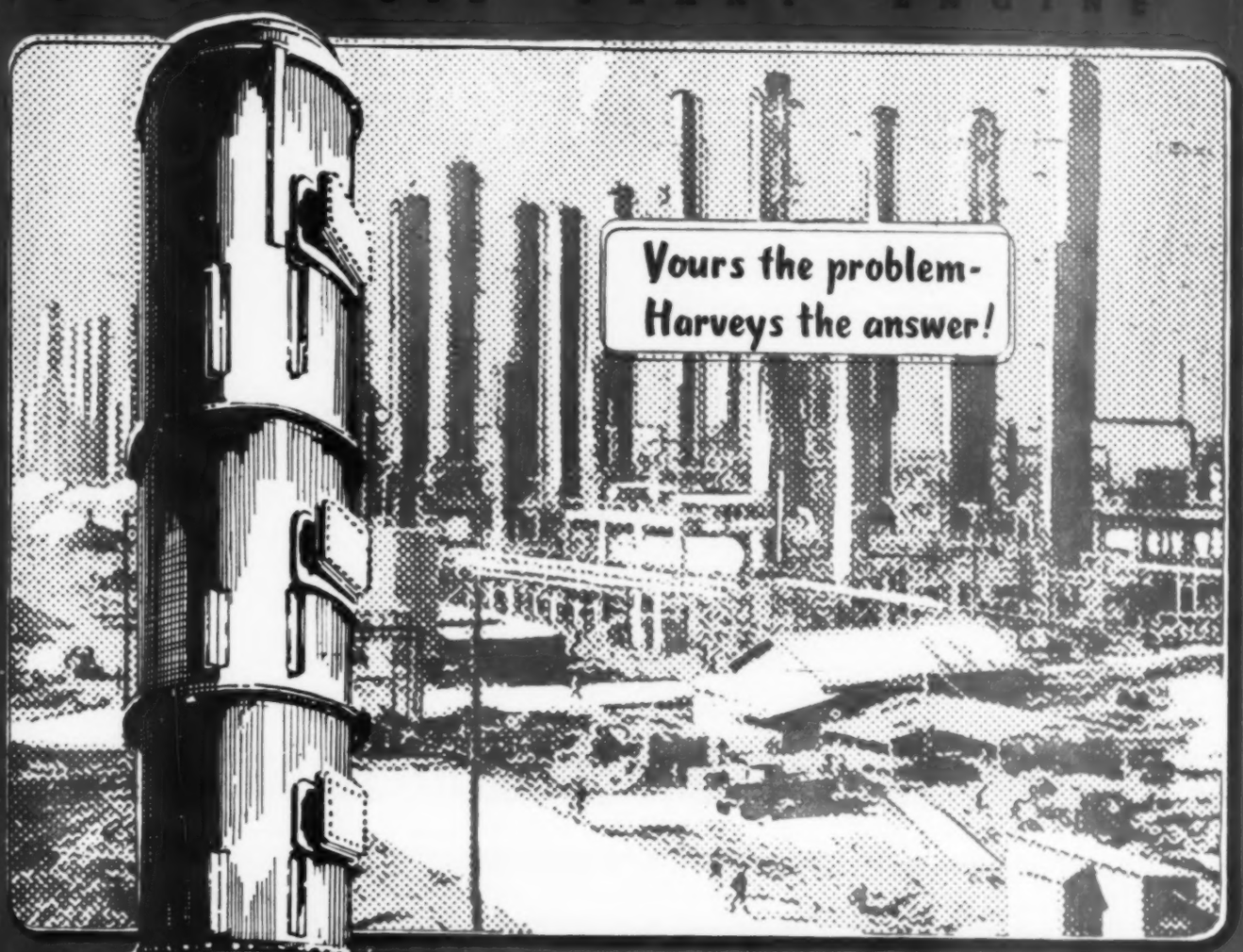

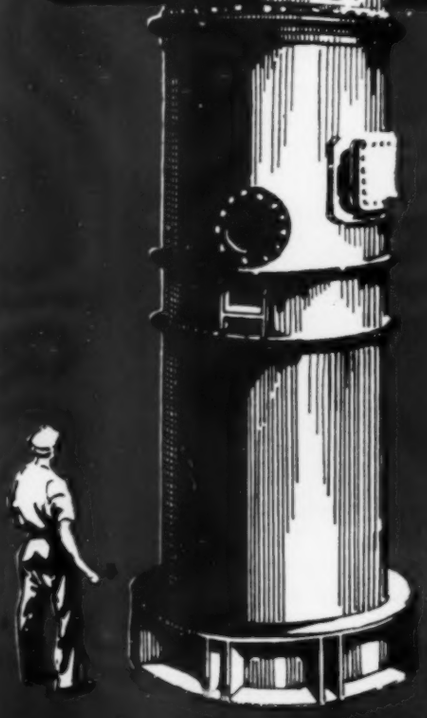

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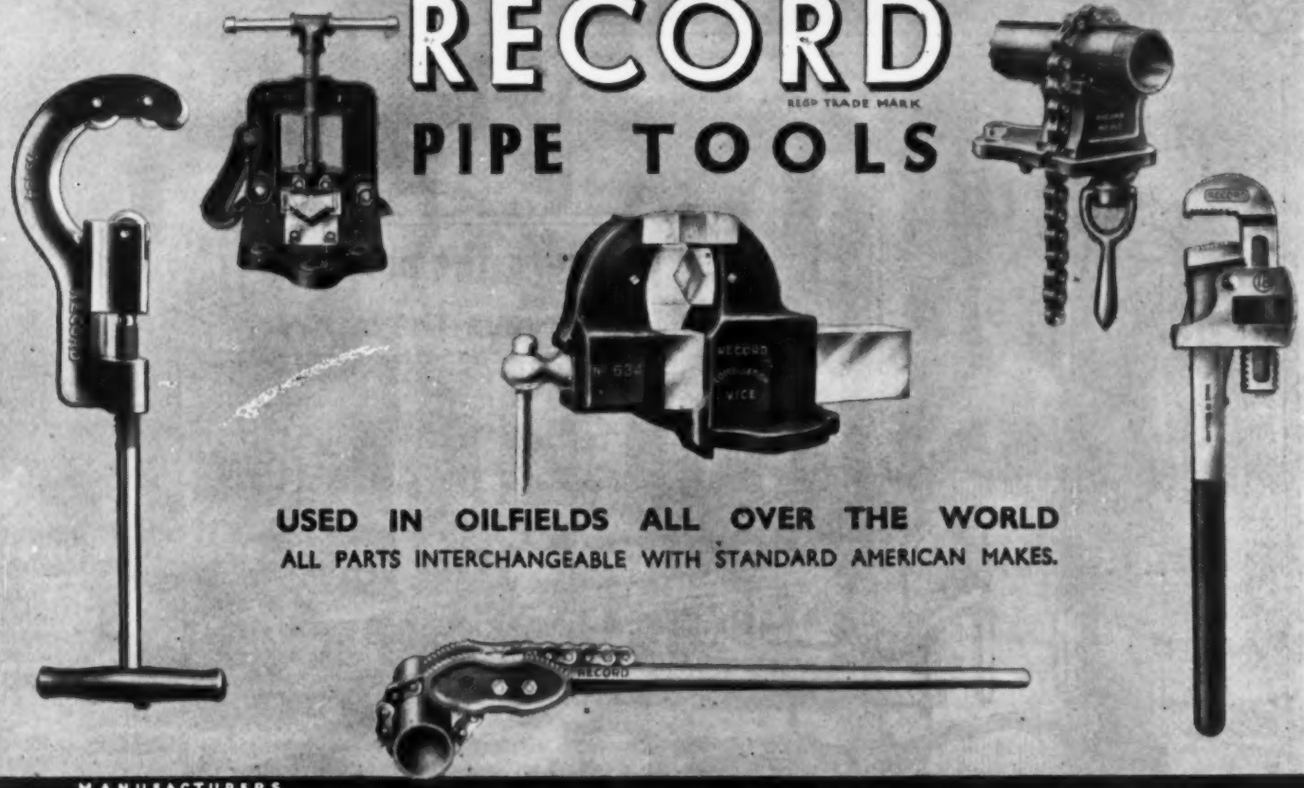

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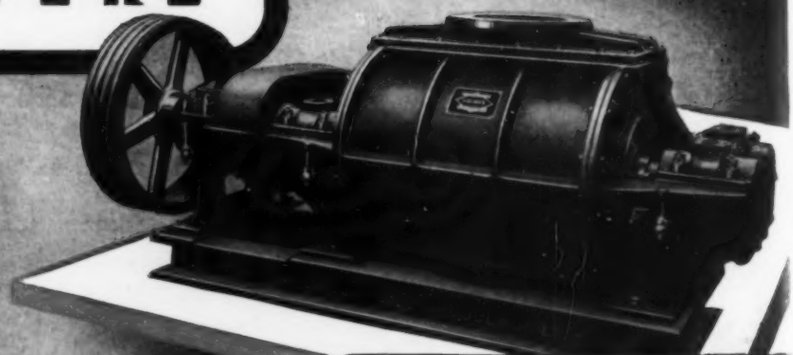

These machines deliver a positive, reliable and oil-free supply of air, economically and efficiently. Absence of internal contact ensures long life, low maintenance costs and continuous operation over long periods.

It is also extensively used for Gas Exhausting or Boosting and over 1,400 machines have been supplied for these purposes.

Manufactured under Licence from Roots-Connersville Blower Corporation of America for Great Britain, the Dominions and Colonies

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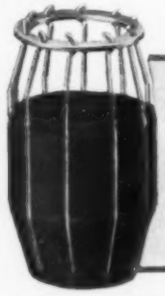
TOP PERFORMER *in every field*

GUIBERSON TYPE "K" SWAB

FIELD MEN EVERYWHERE ACCLAIM
THE TYPE "K" SWAB AS THE LEADER

Built to carry more fluid at every stroke, the Type "K" Swab gives championship performance in every type of well, deep or shallow. It's the *only swab that utilizes the correct swabbing principle.* The cup continues to make a perfect seal as it automatically takes up its own wear. Ample bypass area through mandrel combined with flexible cup insures fastest falling. Compact and simple, removal of only one nut is required to change cups. Guiberson Type "K" Swabs are made for every tubing and casing size.



flexible BASKET" CUP

Flexible spring steel wires hold cup shape and increase cup life. Moulded-in steel bushing takes greatest portion of lift-load. Cups are made of oil resistant compound, which has great resistance to abrasion and the high strength necessary for swabbing requirements.

TYPE "K" TUBING SWAB—Two cup unit on a one-piece mandrel with integral valve body and full opening ball valve and bullet-nose retaining nut. Made in all tubing sizes from 1½" to 4".

TYPE "K" CASING SWAB—Is equipped with ribbed, streamlined check valve to give least resistance when entering fluid and afford positive guide when running in the hole. Made in all casing sizes from 4½" to 13⅜" O.D.

Established 1919

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FOR FUEL OIL
LUBRICATING
OIL AND
SPECIAL
SERVICES

Design approved by the Admiralty Classification Societies

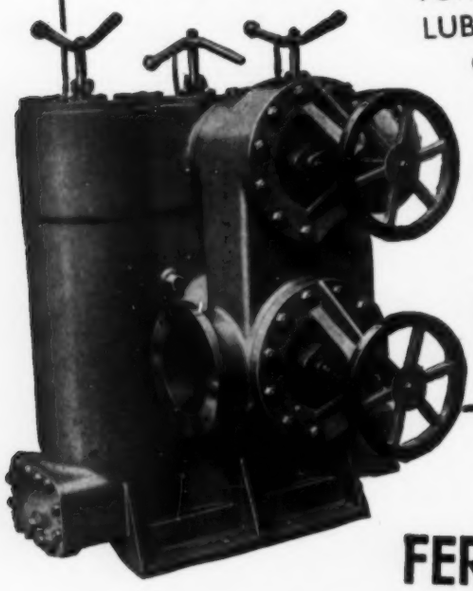

Illustration shows a 10" TRIPLE PACK 'CLINSOL' STRAINER WITH BYE-PASS VALVE

'TITAN' N.S. 70 TYPE SUPERJECTOR

This is a radically different development of the High Speed Centrifugal Separator

It

- WORKS CONTINUOUSLY
- DISCHARGES SLUDGE AUTOMATICALLY
- DECREASES LABOUR AND
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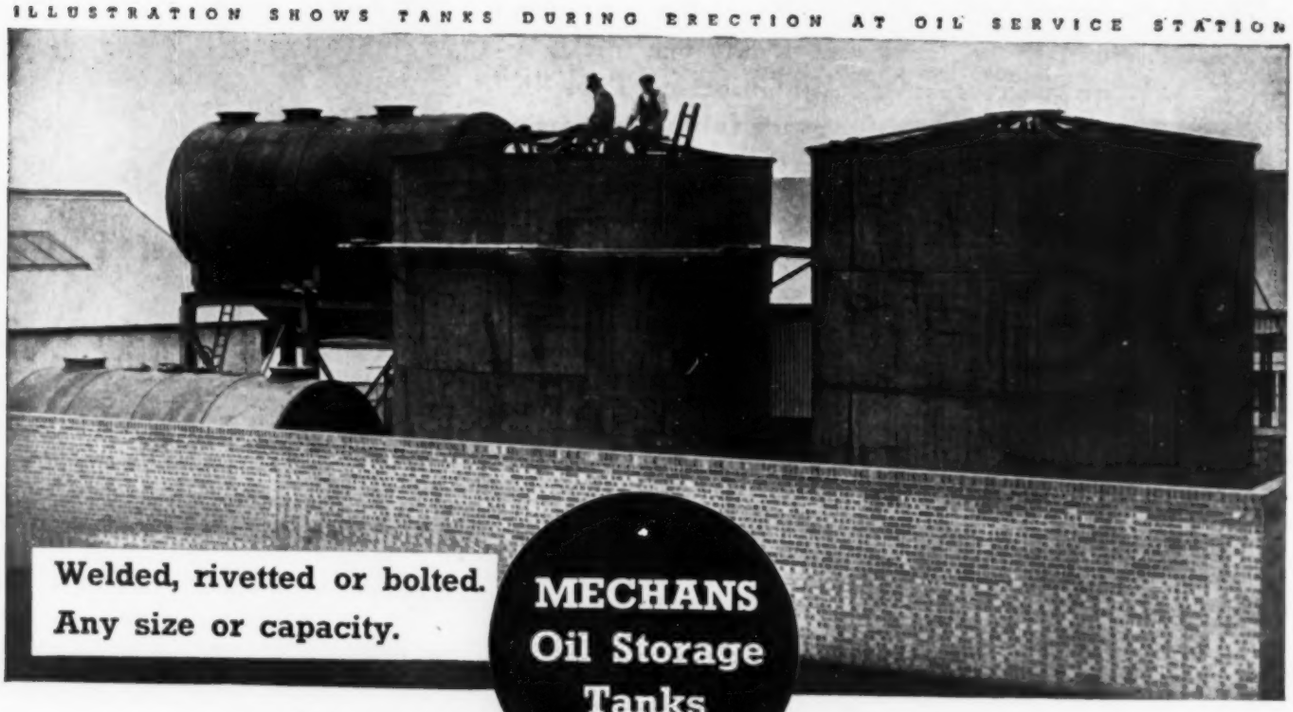
ILLUSTRATION SHOWS TANKS DURING ERECTION AT OIL SERVICE STATION



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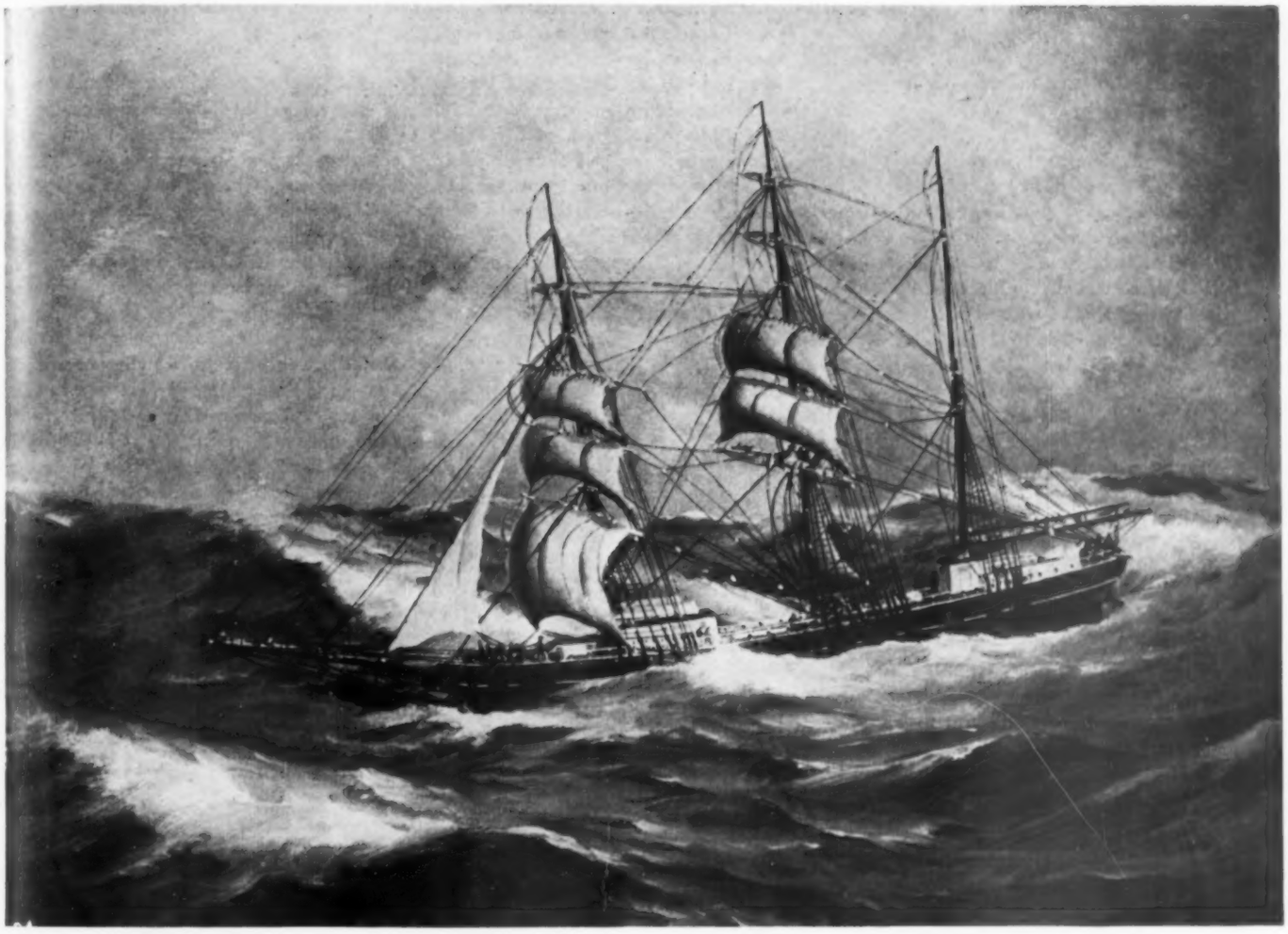

The Barque Georgietta, 459 tons, "running down her easting" in the Indian Ocean, en route to Australia from New York, in the "eighties", carrying case oil.

SINCE THE DAYS OF SAIL AND CLIPPERS

Standard-Vacuum Oil Company and its affiliated companies pioneered the distribution of petroleum products in Australia, New Zealand, the Far East, India, South and East Africa. For over 50 years we have marketed high grade petroleum products in those areas.

Standard-Vacuum Oil Company

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Petroleum's Modern Progress

(Continued from page 68)

a considerable variety to meet all the many needs of modern life.

These illustrations will show that, in the years between the wars and greatly during the last six years the petroleum industry, quite apart from its vast supply activities, made a large contribution to final Allied victory on the technological side by the research and development work it fostered and by the rapidity with which laboratory work was translated to large-scale operation.

I do not think I can have given the impression that on the outbreak of war all this recent contributory effort was at once mobilized, or mobilizable. The war brought a great challenge to science, not least to that science which, in so many forms, is concerned with petroleum. It brought constantly increasing and constantly varying demands, and it brought, as we know, many hazards. That challenge and those demands were, I think, fairly met by petroleum and the men who dealt with it. Personally, I feel that the most significant achievement was the eventual production of the spirit which kept the Allied aviators victoriously on the wing, and in that achievement I shall always be proud of the part played by the industry.

What of the future? Some years ago, Dr. Dunstan prophesied that petroleum would be regarded as a confused collection of chemical substances which, by careful selection and rearrangement, could be converted into practically any organic material required, be it fuel or lubricants, chemicals for synthesis or synthetic food-stuff. His prophecy is now coming true, and we have before us an ever-widening panorama of possibilities. So far, the rearrangement and chemical conversion of petroleum hydrocarbons have been largely limited to the lower-boiling fractions, but research is well in hand on the heavier fractions, and we shall soon see similar radical changes elsewhere.

The petroleum industry cannot rest content with its past achievements. It must progress, for the evolutionary process continues. New and better products of all types must be elaborated to satisfy new wants in the days to come. The internal-combustion reciprocating engine, assisted to its present state of excellence by the petroleum expert, may be past its zenith, and a helping hand must now be given to the prime movers of the future. In 1939, when Lord Cadman gave what proved to be his last address to members of this Institute, he said: "The internal combustion engine might still be improved in matters of degree. For any revolutionary change, however, I think we must look elsewhere. My own hope is pinned to the development of an internal combustion turbine using heavy fuel." Since 1939 developments have been rapid. The internal-combustion turbine for aircraft has been produced, and super fuels must be created for it, as super fuels were developed for reciprocating engines.

A word or two in conclusion. During the course of this talk I have had occasion, quite inevitably, to dwell much on the part played by petroleum in the operations of war. It is indeed regrettable that, in common with so much other scientific advancement in so many other spheres of human knowledge, the science associated with petroleum and the petroleum engine should have contributed so much to accentuate the horrors, the intensity of the conflict. But there is, fortunately, another and happier side in respect of their contributions to the advance of civilization and in the arts of peace. It may, and doubtless will, fall to some future lecturer to dwell on so congenial a topic. I should, indeed, have liked myself to have enlarged on it, but time unfortunately does not permit.

Petroleum is indeed, a very protean substance; it can assume all shapes, even, I think, the shape of things to come! Of one thing, however, I am sure. The men and the materials and the organization exist which can make these things practicable. The future is theirs but, in their assured advance, one fleeting glance backward, such as I have given you today, will make it clear that, in a somewhat earlier decade, the late Lord Cadman did much, very much, to help them on their way.

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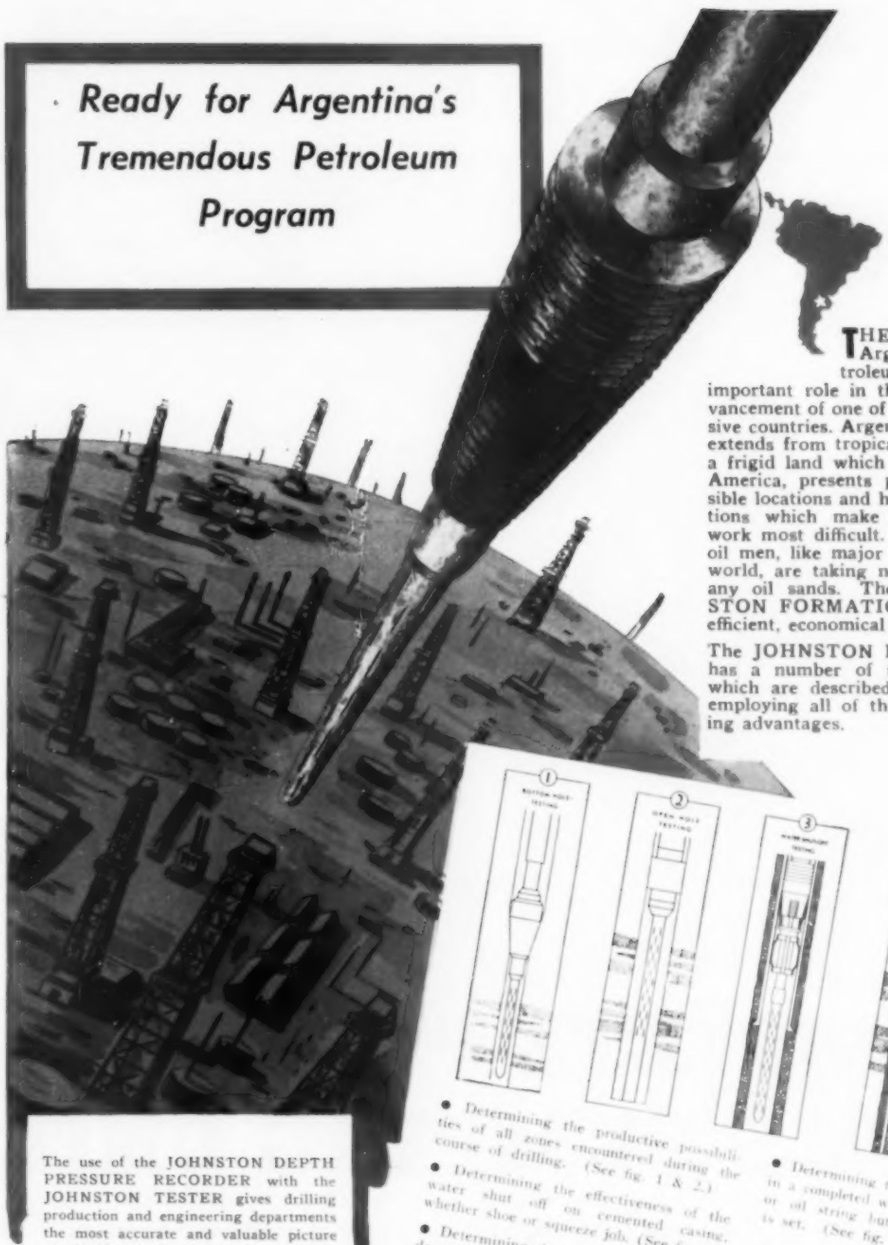

THE proper development of Argentina's tremendous petroleum resources will play an important role in the economic life and advancement of one of the world's most progressive countries. Argentina, whose vast territory extends from tropical jungles in the north to a frigid land which touches the tip of South America, presents problems due to inaccessible locations and hazardous operating conditions which make exploration development work most difficult. Progressive Argentinian oil men, like major operators throughout the world, are taking no chances on passing up any oil sands. They're relying on JOHNSTON FORMATION TESTERS to insure efficient, economical drilling programs.

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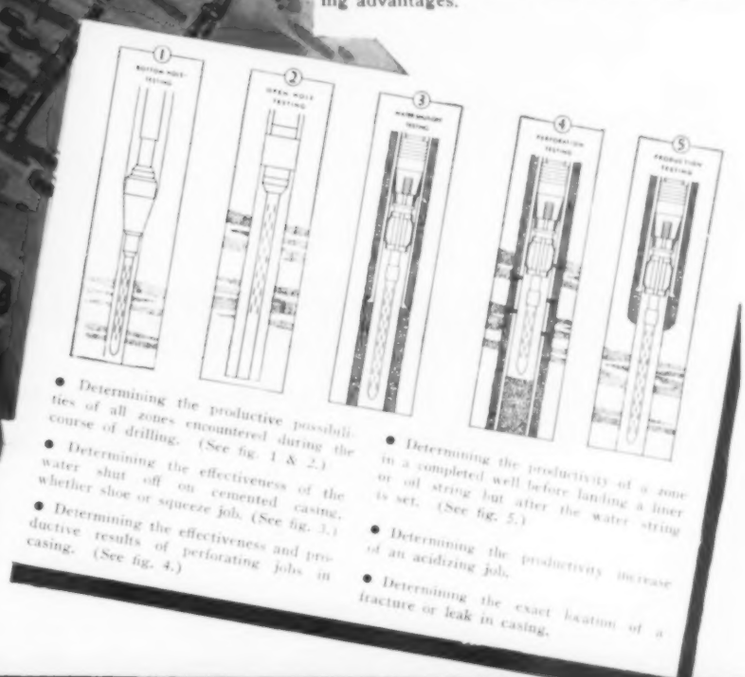

- Determining the productive possibilities of all zones encountered during the course of drilling. (See fig. 1 & 2.)
- Determining the effectiveness of the water shut off on cemented casing, whether shoe or squeeze job. (See fig. 3.)
- Determining the effectiveness and productive results of perforating jobs in casing. (See fig. 4.)
- Determining the productivity of a zone in a completed well before landing a liner or oil string but after the water string is set. (See fig. 5.)
- Determining the productivity increase of an acidizing job.
- Determining the exact location of a fracture or leak in casing.

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THESE BUILD NATIONS

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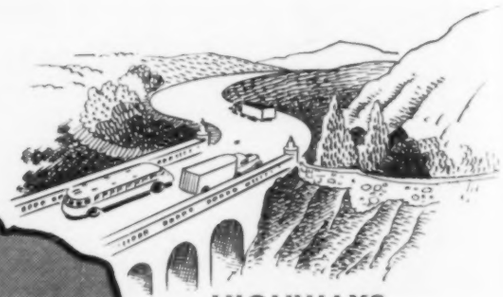
PUBLIC UTILITIES

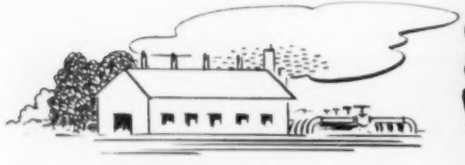


HIGHWAYS

WATER PLANTS

AIRPORTS

SEWAGE SYSTEMS



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Williams Brothers Corporation organization, with thirty years' experience in the construction industry, are in Latin America to build and improve transportation facilities. They specialize in building pipe lines, pump stations, tanks, highways, bridges, airports, terminals and other types of construction for national development. They offer to nations and business concerns the engineering knowledge, skilled organization and the vast network of equipment with which they have served the U.S. Government and industry on wartime construction in the United States, Canada, Africa, Panama, Venezuela and other countries.

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Q. Which company is the world's largest refiner and marketer of 100% Pennsylvania Oil?

A. TIDE WATER ASSOCIATED OIL COMPANY

New York Tulsa San Francisco

When the Oil Wells Run Dry

The above caption is the title—chosen by the publishers and not by the author—of a book which gives only a modicum of attention to the question of what shall be done when there is no more oil in the ground and no more coal from which petroleum products may be synthesized. The answer to that question is that we still have water power, sun-derived energy in different forms, wind-power, and atom-fission, and beyond all these the latent power of growth of perultra plants, which agrobiologic science has shown to be capable of annually yielding the equivalent of 20 or more tons of coal per acre of ground even in temperate regions.

However, the title considerably masks the real nature of the book. The author, Dr. Walter M. Fuchs, formerly of the Kaiser Wilhelm Institute in Germany and now professor of fuel technology at Pennsylvania State College, set himself the task of filling a need for a guide book that would present in one convenient volume an integrated picture of the subject of oil and could serve a broad audience as a handy reference book. The intention was to present the chemist and the technologist with the historical and political aspects of oil, the business man with salient scientific and technological facts, and the average citizen with a survey of all of this. This reviewer feels that Dr. Fuchs has done well to see the need of such a survey, and that he has succeeded in accomplishing his purpose.

The book takes the reader through a resume of oil through the ages, the division of oil resources among the haves and have-nots, and the conflicts which this situation has bred and is still breeding. The gigantic oil business of the United States is given a long chapter in which the subjects of marketing and the role of modern oil refining are interestingly handled. The story of science in the oil industry is also given a long chapter, followed by one on man-made petroleum and another on the "wave of the future," where the author speculates a little on the forms of energy that may be available. There is a chapter on "when the oil wells run dry" but it deals mostly with the factors which may lead to the eventual exhaustion of the world's reserves, which may occur at a distant and still unforeseen time.

Industrial Research Service publishes the book ($3.75).

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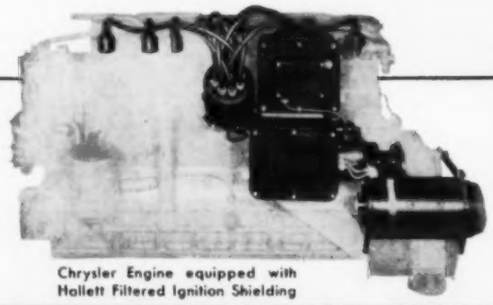
By completely housing the entire electrical equipment (see illustration), Hallett Shielding eliminates any possibility of sparks, leakage or fouling that might ignite highly combustible liquids or gases.

In addition, it moisture-proofs and protects the ignition system itself against water, oil, corrosion and other damage; assuring full engine power, higher efficiency, lower operating and maintenance costs, and longer, trouble-free life for the complete power unit.

Now in oil field service for protective purposes, Hallett Shielding is available in "packaged" kits, ready for installation on most standard types of internal combustion engines. Write the nearest Hallett office for complete information.



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HALLETT FILTERED IGNITION SHIELDING
For Every Type Of Transport Engine

New Flow Indicator

Flow Equipment Co., Maywood, California, has just purchased from Superior Tank and Construction Co. the exclusive manufacturing and sales rights to a new device known as the flow indicator. The instrument is a unique rotary design, so simple that all moving parts can be exchanged right on the line in less than ten minutes for an approximate cost of $20, thereby effecting an important saving to the producer for on-the-spot repairs. Remarkable also is the fact that advanced designing has reduced wear as much as 50 times that of older type instruments.

The new indicator is effective if the crude contains large amounts of sand, paraffin or other foreign matter, due to the cleaning action as it runs. It will mean that the new closed type system of treating oil can be employed with a minimum of waste motion in locating crippled wells in any type crude oil.

Perforates 75,000th Well

Lane-Wells Company and Texas Co. officials recently celebrated the gun perforating of Texaco No. 11 W. S. Rhodes in the Conroe Field, Texas. It was Lane-Wells gun perforating job No. 75,000 and a regular workover job for the Texas Co. Lane-Wells gun perforated its first well in December, 1932 in Santa Fe Springs, California, and introduced the service to the petroleum industry at that time. The first 25,000 wells were gun perforated in a little more than eight years. The last 25,000 were done in just 28 months. The total of 75,000 gun perforating jobs has been done for more than 4,150 oil producing companies in the United States.

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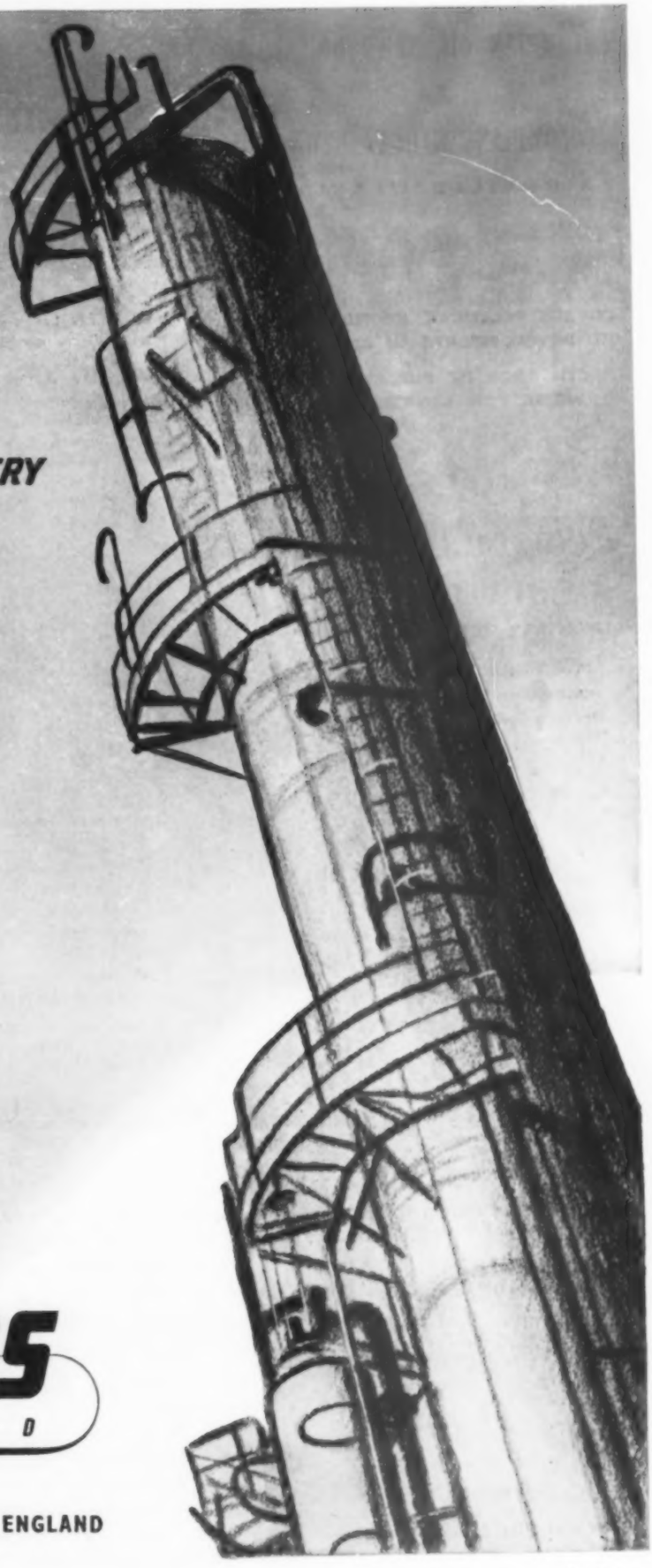

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Opens Venezuela Office

G. R. MADDOX will take charge of a branch office which is to be opened in Caracas, Venezuela, by Clark Brothers Company. Before serving in the army during the past 3½ years Mr. Maddox spent eight years in Venezuela in the production and engineering departments of Standard Oil Co.

J. G. CAMPBELL has been appointed head of a newly organized economics and statistical department in Shell Oil Co., Inc., New York. Before joining the Shell organization in 1941 Mr. Campbell was manager of the statistical department of an investment firm. He was in the personnel department when he joined the Navy during the war.

DALE C. ROGERS, JR., has been made advertising and sales promotion manager of Mid-Continent Petroleum Corp., Tulsa. He succeeds the late A. P. McGrath. Before his war service in the Marines Rogers was a vice president of the Rogers-Gano advertising agency at Houston.

Moves Company to Tulsa

The Warner Lewis Company has acquired full ownership in Flotrol Systems, Inc., and has moved the headquarters from New York to Tulsa. The company manufactures mechanical separators to break down emulsions and eliminate entrained water from oils and chemicals.

Appointed Chief Engineer

Sam A. Wilson, formerly manager of oil fields equipment for the J. B. Beaird Company in Shreveport, has been appointed chief engineer for the Maloney-Crawford Tank and Manufacturing Company, Tulsa. He will be in charge of equipment designing, especially separators, heaters and treaters.

Hughes Joins Western Supply

James E. Hughes has been appointed chief engineer of the Western Supply Co., Tulsa. He will also be in direct charge of Western's heat exchanger sales. Hughes comes to Western from the chemical products department of Phillips Petroleum Company.

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Must have wide and varied experience which qualifies him to take full charge of construction, maintenance and process engineering of a large, complete oil refinery. Exceptional initiative, executive ability and resourcefulness required.

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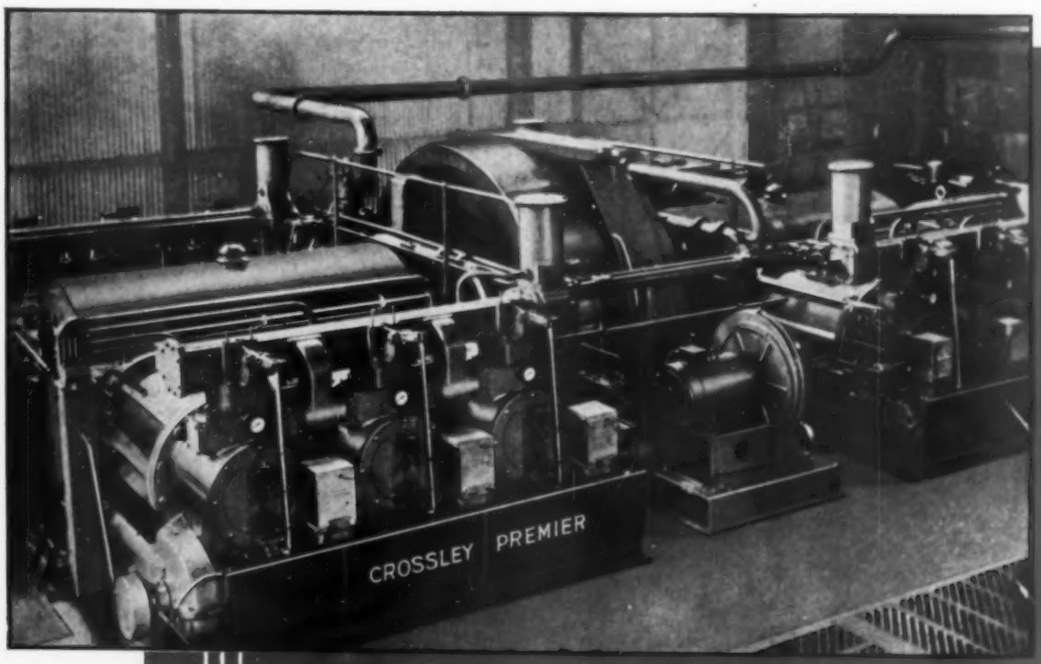

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SANDIACRE, NR. NOTTINGHAM, ENGLAND

Capital Sidelights on Oil

(Continued from page 72)

Furthermore, Mr. Truman said: "The ownership of the vast quantity of oil in such areas (tidelands) presents a vital problem for the Nation from the standpoint of national defense and conservation. If the United States owns these areas, they should not be given away. If the Supreme Court decides that the United States has no title to or interest in the lands, a quit-claim from Congress is unnecessary." Mr. Truman's veto had been expected for some time, even before Congress completed action on the bill and sent it to the White House. It had been thought, however, that enough votes could be mustered in the Senate and the House to over-ride such an action. A prompt attempt, made in the House the morning following the veto, failed by 17 votes of the necessary two-thirds. Having failed there, backers of the bill made no attempt to bring the measure before the Senate.

Walter S. Hallanan, temporary chairman of NPC, peacetime counterpart of PIWC, has called a meeting of the Council for September 26, here. Sometime before that date he hopes to have in the hands of each member copies of the proposals of the committee now working on the blueprint of the Council's organization. Ralph K. Davies, who remained in Washington at the request of Interior Secretary Krug to help set up the government-industry liaison body and to organize the department's new Oil and Gas Division, is expected to return from his vacation in California to attend the meeting. It is likely that the former deputy PAW administrator will definitely resign from government service.

Two petroleum specialists joined the slowly growing staff of OGD the first of August. They are Leo F. Connell, of Washington, D. C., who is a petroleum engineer and served as special consultant on petroleum matters to the Foreign Liquidation Commission for eight months before being transferred to OGD; and Carroll D. Fentress, of Chevy Chase, Md., who comes from the Army.

For seven years before entering the Army in 1942, Fentress was in the research department of Indiana Standard. Since February 1944, he had been assigned to PAW, where as field representative and chief of the process section of the refining division he was responsible for the construction, modification, operation and finally for the orderly shut-down of 25 government-owned, privately operated aviation gasoline facilities.

Connell was with the Sun Oil at Philadelphia for thirteen years before joining the staff of PAW, where he served for three and a half years as assistant director of construction and assistant director of materials.

Robert E. Friedman is assistant director and chief counsel of OGD.

Stainless Steel Fittings

Jack Green, sales manager for the welding fittings division of Tube Turns, Inc., has announced that its post-war line of stainless steel fittings is now available. Three grades of stainless steel which meet requirements of most applications are produced as standards. One grade contains 1 percent columbium and another 2 percent molybdenum.

Needs Technical Literature

Dr. Gustav Egloff of Universal Oil Products Co., Chicago, is appealing to oil men and companies to aid the Chinese in rebuilding their technical libraries. Dr. C. D. Shiah of The National Resources Commission of China, 111 Broadway, New York 6, N. Y., will see that books and journals are properly distributed if sent to him.

Radar Installed on Tanker

Atlantic Refining Co. has installed a surface search radar indicator unit on the S. S. Atlantic Mariner. It is the first such installation on a tanker of the war-developed device used by the U. S. Navy under the name ESPAN.

The equipment includes a large dial in the pilot house which constantly flashes a radar map when the ship is in motion. The picture shows surface objects in a field from 100 yards to 40 miles from the ship, the area scanned being regulated by a knob below the dial. Since the ship can proceed at full speed through storms and fog and enter port without delay, it is believed that it will improve turn-around time of tankers.

New Premium Oil

Standard Oil Company (Indiana) recently announced a new premium grade motor oil under the name "Permalube." Price will be 35 cents per quart. The company will continue its Iso-Vis at 25-30 cents and Polarine at 20-25 cents. The company will continue to market Quaker State as its Pennsylvania oil.

Permalube is to be actively advertised in 1,760 publications and on the radio in 39 states and the District of Columbia. American Oil Co., Pan American Petroleum Corp., and Utah Oil Refining Co. will market Permalube as well as the Indiana company. Advertising claims that Permalube meets the four API tests for a premium oil and offers 14 additional plus properties.

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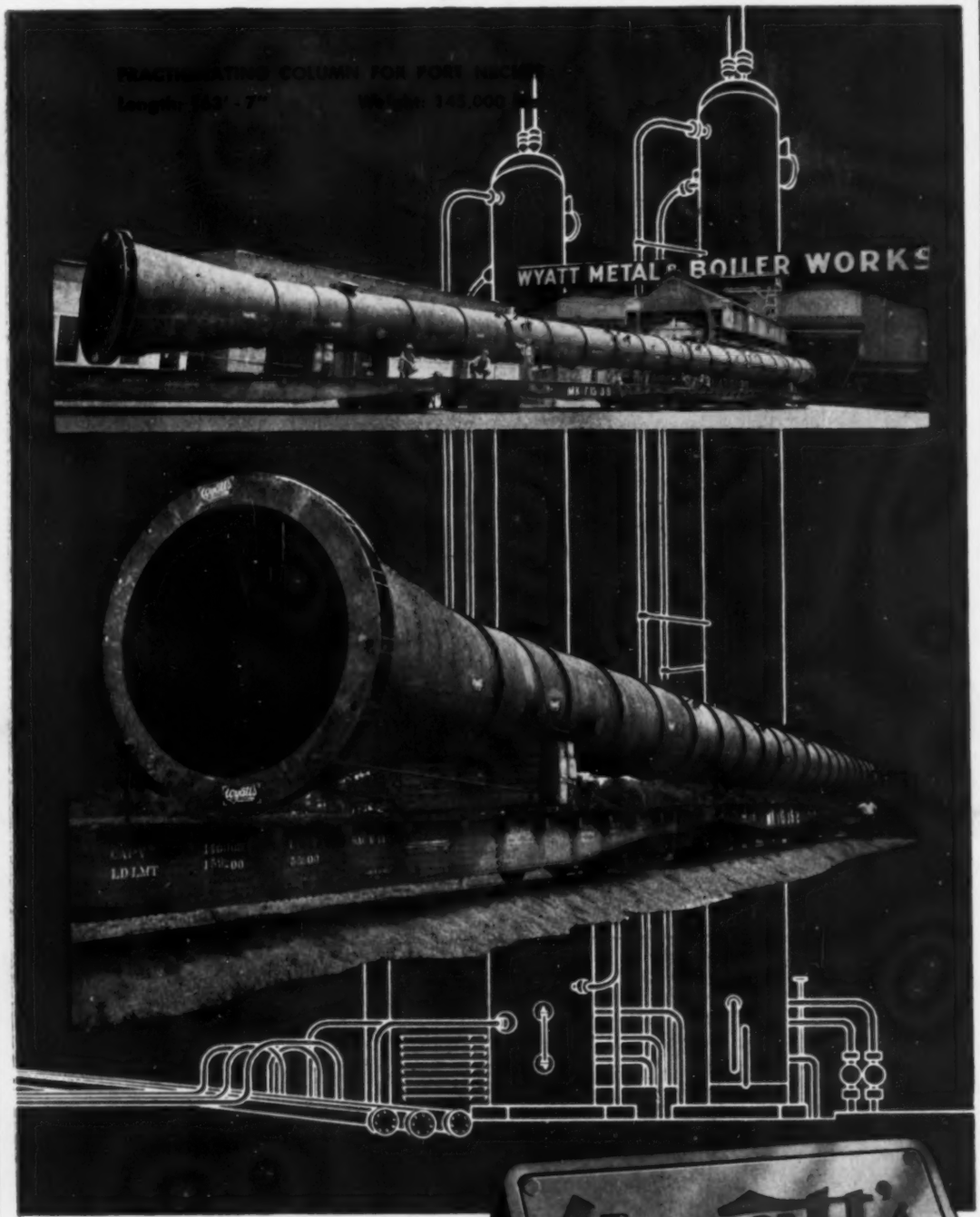

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